BUSINESS PROCESS CHANGE

A Business Process Management Guide for Managers and Process Professionals

FOURTH EDITION

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Paul Harmon

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Fourth Edition

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To my friends who have made my life so much more enjoyable: Roger Addison, Michael Cullen, Jim Eilers, Fred Goldsmith, Bob and Ana Harmon, Paul Heidt, Remco Kobus, Garfield Moore, Cheri Murrell, Willem Smit, and David Sutton

Foreword to fourth edition by Michael Rosemann

Business processes continue to be one of the most important assets of an organization. Like blood vessels, they fill it with life and determine its way and speed of value creation as well as the cost to serve its customer base. Thus processes reflect not only organizational productivity, effectiveness, and efficiency, but also its reliability, complexity, and ultimately its culture. Internally, processes orchestrate the internal system of value creation and, externally, they are an important source of competitive advantage. A well-designed process is the runway for new products and services, but equally process innovation can be a source of new revenue potential when products and services have plateaued.

Processes put work, man, and machine into context. Traditionally, this meant that roles and resources are guided to ultimately arrive at a valuable contribution as the overall process outcome. As such, processes are the recipe for converting organizational resources into guided action. Ensuring compliant process executions is essential to organizations, and the lack thereof has had dramatic consequences for a number of corporations over recent years.

Over time processes have expanded beyond the boundaries of a firm, and we have witnessed the emergence of entire value chains and networks leading to complex, multistakeholder process interdependencies. Fueled by increased digital literacy of our society and ubiquitous computing capabilities, this has allowed citizens to become process participants leading to what could be labeled the democratization of processes.

Nowadays and into the future, processes play an essential role in considering and positioning the possible impact of quickly emerging digital technologies. No longer is the narrative of Business Process Management purely driven by reactively analyzing those parts of a process that are broken (pain points). Rather, technologies such as Artificial Intelligence, advanced data analytics, robotics, or blockchain have expanded the set of process design options and provided companies with new opportunity points. Instead of focusing on optimized processes, economics of scale, and mass production, processes are increasingly aiming toward mass personalization and change more frequently leading to the notion of minimum viable processes.

For all these reasons it is impossible to consider organizations, their operations, the change they undergo, and their ultimate well-being without their processes. In light of this, it is surprising to witness that organizations vary substantially in the extent to which they manage their processes explicitly and with priority.

The ongoing and increasing significance of business processes requires related organizational and technical capabilities and an overall process mindset. This is exactly where this book by Paul Harmon continues to make its significant contribution. In times of rapid technological changes, demographic shifts, and new business model opportunities, this book provides a stable point of reference to comprehend, appreciate, and benefit from the importance of business processes. The breadth and depth of this book has provided a variety of stakeholders, executives, academics, project managers, and process analysts, across the globe and in all industries with the essential frameworks and architectures, life cycles, guidelines, best practices, and case studies needed to approach their very own process challenges and opportunities.

I have no doubt that this fourth edition of *Business Process Change* will again guide countless architects of value and remain a long-lasting source of process knowledge in a fast-changing environment.

Michael Rosemann
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Foreword to third edition by Thomas Davenport

Paul Harmon has a knack for writing clearly about topics that other people tend to obfuscate. Whether the topic is expert systems, e-business, or process management, he cuts through needless complexity and uses clear terminology to get the relevant points across. In this book, of course, he has focused on process management and associated technologies. There are unfortunately many possibilities for obfuscation in this topic area. Other people might confuse technologies with the actual business change involved in process management, but not Harmon. He is always careful, for example, to note that "BPM" means business process management and "BPMS" means systems that help accomplish BPM. If only other writers and speakers on these topics were so careful!

In this regard and in many other ways *BPM* is a model of clarity. All books on BPM should be this clear. In fact, all books about how to manage anything should be this clear. Process management should be treated—as it is in these pages—as one of the basic principles of contemporary management, rather than anything exotic or esoteric.

Why is an extremely clear approach to process management particularly important? One reason is that process management has been somewhat faddish in the past. As a management topic it has been a bit immature, coming in and out of fashion over time. For some reason managers and firms have often latched onto the more fashionable, short-term elements of the approach instead of the more timeless ones. There have been multiple flavors or different religions of the movement, including Total Quality Management, Reengineering, Six Sigma, Lean, and so forth.

Each decade seems to see the rise of a new flavor, although as Harmon describes many of the underlying principles are similar. Perhaps the excitement of a "new" approach (or at least a new combination of previous ideas with a new name) is necessary to get people excited, but there is a downside to this approach. The problem is that devotees of a new process religion become bored as rapidly as they were converted. Basic BPM may not be new or sexy, but it is clearly necessary. Perhaps it should be adopted whether it is sexy or not, and then perhaps it will persist over the long term without cycles or fads. This book goes a long way toward advancing that perspective on processes.

It is also apparent that process management, as it has changed over time, is a synthetic discipline. Each new process management approach has built on previous foundations, and added one or more new elements. This book, I am happy to note, also takes a synthetic, broad approach to process management. Ideally, an organization would be able to draw upon all of the elements or tools available to meet the process management needs of any individual project. Harmon provides a methodology for process management that contains most if not all the attributes an organization could need with regard to improving processes.

The book also takes—at least to my mind—the appropriate perspective on information technology (IT) in the process context. Most approaches to process management either devote too much attention to IT or too little. Some devotees of Reengineering and BPM technologies act as if IT is literally all that matters in improving processes. They usually achieve no business change as a result. Advocates of Six Sigma and Lean usually ignore technology altogether. However, IT is a powerful tool, and to ignore it is to leave a lot of potential change on the table. Harmon's approach is like Goldilocks' porridge: just right. It treats IT not as the primary objective of BPM, but as an enabler. Yet the book has plenty of detail and useful knowledge on how IT can help in managing and improving processes. Harmon has carefully updated the book since the 2002 edition to address the latest technologies in the realm of process management.

Finally, process management advocates—like enthusiasts for other management trends—often pretend that process management is the only business idea that matters. Get that right, the argument goes, and everything else about a business is either irrelevant or will automatically fall into place. Harmon is under no such illusions. He knows that processes must coexist with strategies, value disciplines, enterprise systems, and other aspects of organizational life. The book provides useful guidance on how process management relates to, and can support, other modern management ideas. As with other aspects of the book, it is a sober and realistic approach.

You have picked up the right book for just about any goal you have in process management. If you are an enterprise process architect or manager, Harmon tells you what you need to think about and do at the enterprise level. If you are an owner or improver of a particular business process, there is an entire section devoted to managing particular processes. If you are charged with using IT to support processes, you are similarly in luck. The book should be on the desk, in the briefcase, or on the bedside table of anyone who believes business processes are an important way to understand businesses and make them better.

Thomas Davenport
President's Distinguished Professor of Information Technology and Management, Director, Process Management Research Center, Babson College, Wellesley, MA, United States

Preface to the fourth edition

Business Process Change was originally written in 2002, and published at the beginning of 2003. Since then the interest in business process and the number of business process projects have increased dramatically. In 2002 there were no business process management (BPM) conferences in the United States. In 2010 there were at least a dozen major BPM conferences and dozens of other meetings on more specialized aspects of process change. In 2002 most corporate process work was focused on specific business process improvement projects. In 2010 leading organizations were focused on enterprise business process architectures and on developing corporate performance management and measurement systems that would allow senior executives to plan, monitor, and manage enterprise-wide transformation efforts. Today the focus is on digital transformation and modifying business models to accommodate industry-wide changes in the use of new technologies.

During this same period new tools and methodologies have become common among those undertaking business process change projects. Six Sigma programs in most major corporations have expanded and now include Lean technologies. Several Six Sigma groups have extended their practices to include human performance techniques or aligned their practices with frameworks like the Supply Chain Council's Operational Reference Model (SCOR, which stands for Supply Chain Operations Reference). New process modeling notations have begun to replace earlier notations. There has also been significant work done to integrate business process modeling techniques with business rules technologies.

In a similar way, new software tools have made it possible to automate the day-to-day management of processes. Business process management suite (BPMS) products were unavailable in 2002 and are now widely available and becoming very popular. During the same time period a number of technical standards have been created to support these new software tools.

This book focuses on the entire range of options that business managers face when they seek to redesign, improve, or automate their company's business processes. I have tried to emphasize the relationships between the various approaches. I am convinced, as a result of years of work with leading companies, that the companies that succeed over the long term are those that figure out how to integrate and coordinate all their different business process change options. Any one approach may seem like a fad. In any given year one or another of the approaches will get more attention in the popular business press. But, over the long term all are necessary. Six Sigma with its emphasis on quality and its powerful grassroots organizing abilities, IT with its automation techniques, and those who are focused on strategy, business process architectures, and process management training and evaluation all understand important aspects of processes. Smart managers will insist that practitioners from each of these areas coordinate their efforts to assure that their organizations achieve outstanding results.

In 2003, just as *Business Process Change* was published, Celia Wolf and I founded *Business Process Trends*, http://www.bptrends.com, a web portal that publishes a wide variety of articles on business process practices. As the executive editor of BPTrends, I have been well positioned to observe the evolution of the business process market. In 2006 and 2014 I prepared revisions and, as 2018 draws to a close, I have completed this fourth edition of *Business Process Change.* These updates have been necessary to assure that the book can continue to serve as a comprehensive guide for managers and practitioners who need up-to-date information on current business process practices.

Compared with earlier editions that have made more extensive changes the fourth edition consists of specific edits to improve the text, and short additions to report on new developments. We did consolidate two chapters on software tools into one chapter to reflect the continuing consolidation of the software tools market and we did add a new chapter on artificial intelligence to reflect the growing impact this new technology will make on business process automation in the years ahead.

As in the past, the Business Process Trends website (http://www.bptrends.com) provides an excellent extension to this book. Each month we publish current information on new techniques and case studies that illustrate trends in business process practices. In the earlier edition of *Business Process Change* we included an extensive Glossary and a Bibliography, which quickly became out of date as new terms and books became popular. In this edition we have omitted both and have placed them instead on the BPTrends website so they can be frequently updated.

I want to thank the many, many readers of *Business Process Change* and the members of the Business Process Trends website and its associated BPTrends LinkedIn Discussion site who have talked with me and sent me emails. Business process change is complex and expanding and I have been able to cover it as well as I have only because of the many different people who have taken the time to teach me about all the different kinds of process work that is being undertaken in organizations throughout the world. I can hardly name them all, but I can at least name a few who have provided special insights.

The first book originated in conversations I held with Geary A. Rummler. I worked for Geary in the late 1960s and learned the basics of process analysis from him. I have continued to learn from him and have read everything he wrote.

In 2003 Celia Wolf and I founded Business Process Trends. In 2005 Celia and I joined with Roger Burlton, Artie Mahal, and Sandra Foster to found Business Process Trends Associates (BPTA), an education, training, and consulting services group. Since then BPTA has grown and acquired partners and distributors throughout the world. Today, in addition to our founding group, we work with a wide variety of people who have each added to our overall understanding of process change and the broader business market for process improvement. As I have worked with my BPTA colleagues to create the BPTA curriculum, I have benefited from their extensive and practical experience in affecting business process change, and many of their ideas are reflected in this book.

In addition to the people I have worked with directly a number of people have helped by teaching me about specific technologies or methodologies. I have never met Michael Porter, but his books and writings have taught me almost everything I know about strategy, value chains, and the development of competitive advantage. Joseph Francis, formerly the CEO of the Supply Chain Council first convinced me of the importance of business frameworks and proceeded to demonstrate their power at Hewlett-Packard. George Brown of Intel has also been very helpful regarding both the SCOR framework and the value reference model framework. I owe Pam Garretson and Eric Anderson a great deal for teaching me how Boeing Global Mobility Systems organized its entire division using a process-centric approach. They really demonstrated what a dedicated management team can do to create a process-centric company. I owe a debt to Roxanne O'Brasky, Executive Director of ISSSP, Don Redinius and Ron Recker of AIT Group, and David Silverstein of the Breakthrough Management Group for teaching me more about Six Sigma. Similarly, I owe James Womack of the Lean Enterprise Institute and Steve Bell a great debt for what they have taught me about Lean and the Toyota Production System. I owe a similar debt to Howard Smith of CSC, Peter Fingar, Derek Miers, Rashid Kahn, Bruce Silver, Anne Rozinat, Phil Gilbert, and Eric Herness for teaching me about the nature and potential of BPMS products.

I owe thanks to Qualiware, a software tools company in Denmark, and Qualisoft, a business consulting services company in Norway, for providing screenshots that illustrate the use of BPTrends diagrams during process design. I specifically want to thank Tore Rasmussen, Jacob Lund, Martine Hagen, Terje Haugland, and Fredrik Nag for their help in preparing the screenshots.

I owe thanks to Stephen White for his many conversations on notation and Business Process Model and Notation and to David Frankel, Sridhar Iyengar, Fred Cummins, and Richard Mark Soley for their ongoing insights into the evolution of the software market and the Object Management Group's standards-setting process. Thanks are also due to those who have talked with me about human performance analysis, including Roger Addison, Carol Haig, Alan Ramias, Rick Rummler, and Guy Wallace. I also owe a debt of gratitude to Michael Rosemann, Michael zur Muehlen, Wil van Aalst, Wasana Bandara, Jan Mendling, Jan vom Brocke, Marlon Dumas, Marcello La Rosa, and Hajo A. Reijers for keeping me abreast of academic developments in BPM. I also owe thanks to Kevin Brennan for keeping me aware of developments in the business analyst community, and to Curt Hall for our continuing conversations on business rules and artificial intelligence in all its manifestations. I want to thank Thomas Davenport for his insight and support over the last few years and for writing the Foreword to the third edition. I also want to thank Michael Rosemann of the Queensland University of Technology's Business Process Management, for writing a Foreword to this latest edition of *Business Process Change*.

This just scratches the surface, however. I also owe thanks to many others for their special insights into business process practices and technologies. With apologies to anyone I have accidentally omitted, this list includes: John Alden, Paul Allen, Michael Anthony, Gopala Krishna Behara, Oscar Barros, Conrad Bock, Jim Boots, Peter Bolstorff, David Burke, Allison Burkett, Frits Bussemaker, Richard Butler, Mike Costa, David Chappell, Brett Champlin, Fred Cummins, Bill Curtis, Joseph DeFee, Henk de Man, George Diehl, Jean-Jacques Dubray, Chuck Faris, Paul Fjelstra, Peter

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Each of these individuals helped make this book better than it would have been otherwise. Needless to say, in the end I took everything that everyone offered and fitted it into my own perspective and expressed it in my own words. Those who helped can take credit for the many good things they suggested, but can hardly be blamed for the mistakes I am sure I have introduced.

I owe a very special debt to Geary Rummler for providing me with a solid foundation in business process change and to Roger Burlton who worked with me to develop the process methodology described in this book. Many of the key concepts in this book, like the Scope Diagram, were derived from Roger's earlier work in process redesign.

Finally, I want to thank Celia Wolf one more time. We have worked together over the past 20 years to create the Business Process Trends website and BPTA. She has consistently proven to be both a wise partner and a wonderful friend. I could not have done it without her support and encouragement.

Paul Harmon
Las Vegas

Introduction

We live in a world that changes faster all the time. What worked only yesterday may not work today and much of what works today won't work tomorrow. Smart managers know that organizations that succeed do so because they adjust to keep up with the changes that are taking place. This book is about business process change. It describes how smart managers analyze, redesign, and improve the business processes they manage.

Every year dozens of books are written by management consultants to advocate some great new management idea. Some of these new ideas have merit, but most are simply fads that are popular for a year or two and then gradually fade. This book is not such a book. In the first place, this book describes a variety of process change techniques that have been proven over the course of many decades. It describes how organizations can achieve efficiencies by integrating and improving their business processes and by aligning those business processes with corporate strategies and goals. Organizations that routinely practice business process improvement, using the techniques described in this book, are able to consistently improve on the results obtained from existing processes. Organizations that undertake more extensive business process redesign efforts frequently achieve improvements in excess of 50%. This is not miraculous; it simply reflects the fact that most existing processes are less efficient than they could be and that new technologies make it possible to design much more efficient processes.

This book was not written to hype the idea of process change. If you need convincing or motivation, you should read one of the popular books that have been written to do just that. This book is designed to help you actually make process change happen, systematically and consistently.

Levels of Concerns

Organizations undertake process change initiatives for a variety of reasons. Organizations new to process work usually start by deciding to improve a specific business process. More experienced companies usually have some kind of corporate business process architecture and a business process management (BPM) group assigned to consider all possible process change initiatives, to prioritize interventions, to coordinate efforts, and to document results. Organizations that are more sophisticated usually support a number of ongoing activities that are managed at the enterprise level. These business initiatives may include the maintenance of a corporate business process architecture, the ongoing measurement and analysis of process performance, and some kind of corporate process management. These activities are not typically projects, but ongoing managerial processes performed to support executive decision-making efforts and to define specific process change opportunities.

At the same time, these organizations normally undertake a variety of specific projects to create, redesign, or improve specific business processes. These projects are usually managed by divisional or departmental managers. We refer to these projects as *process level concerns*.

Allied to the projects at the process level, but at a further remove, are more specific projects undertaken to acquire and install new software applications or to create new training courses that will actually implement changes defined at the process level. Thus, for example, an *enterprise-level BPM* group might decide that a company supply chain is operating inefficiently. The BPM group initiates a *supply chain process redesign* effort. The supply process redesign project team undertakes a study of the supply chain, considers options, and concludes that a number of different changes should be made. Once the process level project team's recommendations are approved by senior management, information technology (IT) launches an *implementation level* project to acquire new enterprise resource planning (ERP) software to support some of the changes in the supply chain. At the same time, training creates new job descriptions and launches a separate implementation-level project to develop a new training course to provide new employees with the skills they will need to implement the new supply chain process.

One of the major insights we have drawn from studying a wide variety of business process efforts during the past several years is that it is very useful to distinguish between the various levels of concern. Projects or activities at different levels require different participants, different methodologies, and different types of support. We illustrate these three different levels of concern with the business process pyramid shown in Figure I.1.

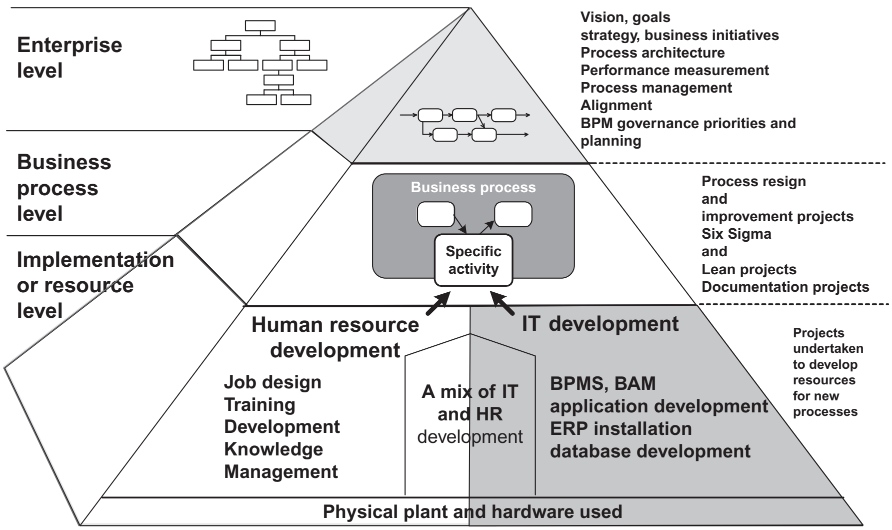

FIGURE I.1

The business process pyramid.

Throughout this book we will rely on the distinction between different levels of concern to help organize our discussion. We will describe the major process initiatives being undertaken at each of the three levels and present appropriate methodologies for work at each of these levels. Some of the material will be the same as it was in the first edition of *Business Process Change*, but there are also new insights, concepts, and techniques that have evolved and become popular during the past 15 years. This is especially true at the enterprise level, where business process architectures are now the focus of efforts at leading companies, and at the IT implementation level, where new Business Process Management Software (BPMS) products have become popular. Each of these developments, and others besides, are rippling through all aspects of business process work and effecting subtle changes in emphasis and practice.

The *Business Process Trends* website (http://www.bptrends.com) has undertaken a survey of its readers every other year since 2005 to determine what companies were doing to support business process change. The questionnaire remains online for a little over a month, and during that time hundreds of people complete the questionnaire. The respondents came from large and small companies from throughout the world and from a wide variety of different industries. Given the size of the response and the distribution of the respondents, we believe this represents the best current data on worldwide business process activity.

Every time we undertake the survey we ask if the respondents' organizations are active in any aspect of business process change. About 25% of the organizations that respond say they have a major strategic interest in BPM. About 25% say they have no interest or are exploring the possibilities. Everyone else falls in between.

We also asked respondents to indicate what the term *BPM* meant to them. The largest group of respondents (40%) say that BPM is a "top-down methodology designed to organize, manage, and measure the organization's performance based on the organization's core processes." This response is consistent with lots of other data about why companies undertake business process projects. In bad times, companies seek to make their processes more efficient to save money. In expansive times, companies seek to redesign processes to make them more competitive, to offer new services, or to get into new lines of business. Or they acquire companies and have to integrate the processes used at the two different organizations. In addition, especially during expansive periods, companies look to see if they can gain a competitive advantage by incorporating a new technology. During the past several years much technology-driven work has been a result of developments in Internet and digital technologies and companies have redesigned processes to let customers or employees access information and make purchases via the Web, or to take advantage of the communication efficiencies offered by email or Internet-based phone services.

The fourth major reason for undertaking business process change is perhaps the most interesting, and ultimately the most revolutionary. A growing number of leading companies have begun to believe that a corporate-wide focus on process provides a superior way of managing the company. These companies tend to be in industries that are undergoing rapid, extensive changes. Their senior executives have concluded that they need the insights and the agility provided by a process-oriented approach to management to respond quickly and effectively. These are the organizations that are making major commitments to developing enterprise-level business process tools and management systems to assure that they have aligned all their business resources and functions to their value chains and can manage those processes in something close to real time.

To summarize this more graphically, consider Figure I.2. In this case, we use the process pyramid to suggest changes that have occurred between the emphasis on process that was typical of leading organizations in the 1990s and the emphasis we see at leading organizations today.

In the 1990s most organizations were focused on business process redesign or reengineering projects. Leading companies focused on processes that cut across departmental or functional lines, but most companies concentrated on redesigning processes within specific departments or functional units. At the same time, Six Sigma was popular in manufacturing organizations for process improvement efforts. Toward the end of the 1990s standard or off-the-shelf software applications, such as ERP and customer relationship management (CRM), became a popular way to standardize processes and reporting systems. During this same period workflow systems became popular as tools to automate document-processing systems. In the past 6 years, all of these process change strategies have continued to be popular. Today, however, leading companies are putting more emphasis on developing enterprise-wide business process architectures and corporate performance management systems. They seek to standardize specific processes throughout their divisions and subsidiary

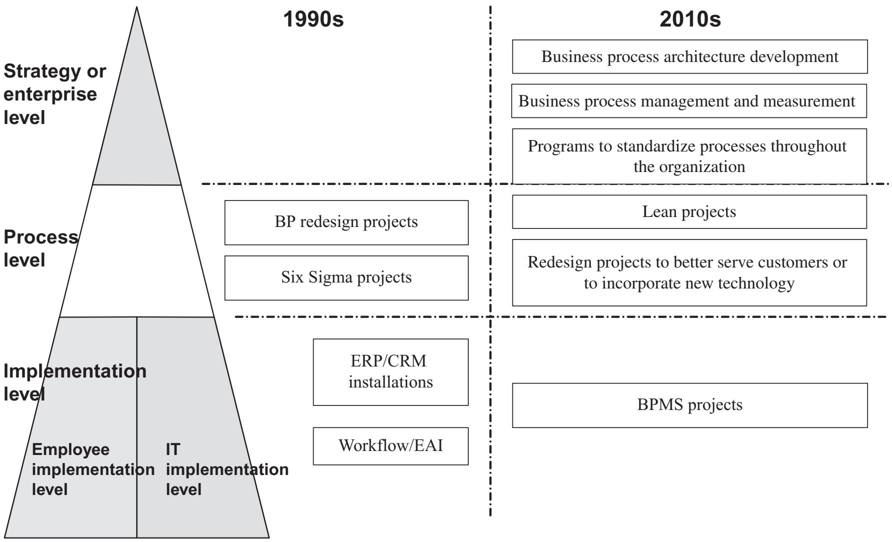

FIGURE I.2

Changes in focus at leading companies.

organizations to assure that the same ERP or CRM modules can be used throughout the corporation, and they seek to understand their corporate value chains to assure regulatory compliance. At the same time, there is major emphasis on installing new software automation technologies—usually termed *Business Process Management Systems* (BPMS)—to automate the day-to-day control of processes and to provide real-time performance data for senior management.

This book is written for today's manager and focuses on the business process change problems today's managers face. This book was written to educate managers in the best practices available for today's challenges and to provide practical tips for anyone undertaking the development of a business process architecture, undertaking a business process change project, or considering the development of a BPMS application.

Business Process Change and Management

Every company wants to improve the way it does business, produce things more efficiently, and make greater profits. Nonprofit organizations are also concerned with efficiency, productivity, and with achieving the goals they set for themselves. Every manager understands that achieving these goals is a part of his or her job.

Consider the management of the automobile industry. The first internal combustion automobiles were produced by Karl Benz and Gottlieb Daimler in Germany in 1885. In the decades that followed, some 50 entrepreneurs in Europe and North America set up companies to build cars. In each case the companies built cars by hand, incorporating improvements with each model. Henry Ford was one among many who tried his hand at building cars in this manner.

In 1903, however, Henry Ford started his third company, the Ford Motor Company, and tried a new approach to automobile manufacturing. First, he designed a car that would be of high quality, not too expensive, and easy to manufacture. Next he organized a moving production line. In essence, workmen began assembling a new automobile at one end of the factory building and completed the assembly as it reached the far end of the plant. Workers at each point along the production line had one specific task to do. One group moved the chassis into place, another welded on the side panels, and still another group lowered the engine into place when each car reached their station. In other words, Henry Ford conceptualized the development of an automobile as a single process and designed and sequenced each activity in the process to assure that the entire process ran smoothly and efficiently. Clearly, Henry Ford had thought deeply about the way cars were assembled in his earlier plants and had a very clear idea of how he could improve the process.

By organizing the process as he did, Henry Ford was able to significantly reduce the price of building automobiles. As a result, he was able to sell cars for such a modest price that he made it possible for every middle-class American to own a car. At the same time, as a direct result of the increased productivity of the assembly process, Ford was able to pay his workers more than any other auto assembly workers. Within a few years Ford's new approach had revolutionized the auto industry, and it soon led to changes in almost every other manufacturing process as well.

Ford's success is a great example of the power of innovation and process improvement to revolutionize the economics of an industry. Other examples could be drawn from the dawn of the Industrial Revolution or from the early years of computers, when mainframes revolutionized the census process in the United States and began to change the way companies managed their accounting and payroll processes.

The bottom line, however, is that the analysis of business processes and their improvement to increase the efficiency and productivity of companies is a perennial management responsibility. Managers, of course, have other responsibilities, but one of the most important requires that they constantly examine the processes by which their companies produce products and services and upgrade them to assure that they remain as efficient and effective as possible.

Some business process gurus have advocated crash programs that involve major changes in processes. In a sense they are advocating that today's managers do what Henry Ford did when he created the moving production line. In some cases this kind of radical redesign is necessary. Today's managers can often use computers to automate processes and achieve major gains in productivity. Similarly, in responding to challenges created by the Internet, some managers have been forced to create new business processes or to make major changes in existing processes. Amazon.com and eBay come to mind. In most cases, however, gradual improvements are more effective.

There are other times, however, when a crash program is too far reaching and a gradual improvement effort would not be enough. These are cases that we refer to as business process redesign projects. They implement a significant change without redesigning the entire process. Many projects that automate a portion of an existing process fall in this category. In some cases, redesign takes place in a series of steps to minimize disruption. A series of modules, for example, could be installed over the course of several months, one after another, with enough time between each change to assure that the employees can adjust as the changes are made.

The Evolution of an Organization's Understanding of Process

Managers have been thinking about business process change for several decades now. Some organizations are more sophisticated in their understanding of business processes than others. Software organizations, for example, have spent quite a bit of time thinking about the software development process. In the 1990s the Department of Defense (DOD) funded a major effort to determine how the software development process could be improved. This task was entrusted to the Software Engineering Institute (SEI), which is located at Carnegie Mellon University. The SEI/DOD effort resulted in a model of the stages that software organizations go through in their understanding and management of processes.

The SEI model is known as the Capability Maturity Model (CMM). It was initially described in a book, *The Capability Maturity Model: Guidelines for Improving the Software Process*, published in 1995. In essence, the CMM team defined five stages that organizations go through as they move from an immature to a mature understanding of business processes. These stages were defined using examples from software organizations, but they apply equally to any large organization.

Although the CMM model is more commonly applied to large organizations, the model can also serve as an excellent reference model for small- and medium-size firms. Remember the key point of such reference models is to help you understand where you are today and to assist in developing a roadmap to help you get where you want to go. No one is suggesting that all companies should attempt to follow the model in the same exact way.

The key assumption that the CMM team makes is that immature organizations do not perform consistently. Mature organizations, on the other hand, produce quality products or services effectively and consistently. In the CMM book, they describe it this way:

> *In a mature organization, managers monitor the quality of the software products and the processes that produce them. There is an objective, quantitative basis for judging product quality and analyzing problems with the product and process. Schedules and budgets are based on historical performance and are realistic; the expected results for cost, schedule, functionality, and quality of the product are usually achieved. In general, the mature organization follows a disciplined process consistently because all of the participants understand the value of doing so, and the necessary infrastructure exists to support the process.*

Watts Humphrey, one of the leading gurus behind the CMM effort, describes it this way:

> *An immature software process resembles a Little League baseball team. When the ball is hit, some players run toward the ball, while others stand around and watch, perhaps not even thinking about the game. In contrast, a mature organization is like a professional baseball team. When the ball is hit, every player reacts in a disciplined manner. Depending on the situation, the pitcher may cover home plate, infielders may set up for a double play, and outfielders prepare to back up their teammates.*

CMM identified five levels or steps that describe how organizations typically evolve from immature organizations to mature organizations. The steps are illustrated in Figure I.3.

The CMM model defines the evolution of a company's maturity as follows:

- *Level 1: Initial*. The process is characterized by an ad hoc set of activities. The process is not defined and success depends on individual effort and heroics.
- *Level 2: Repeatable*. At this level, basic project management processes are established to track costs, schedule, and define functionality. The discipline is available to repeat earlier successes on similar projects.

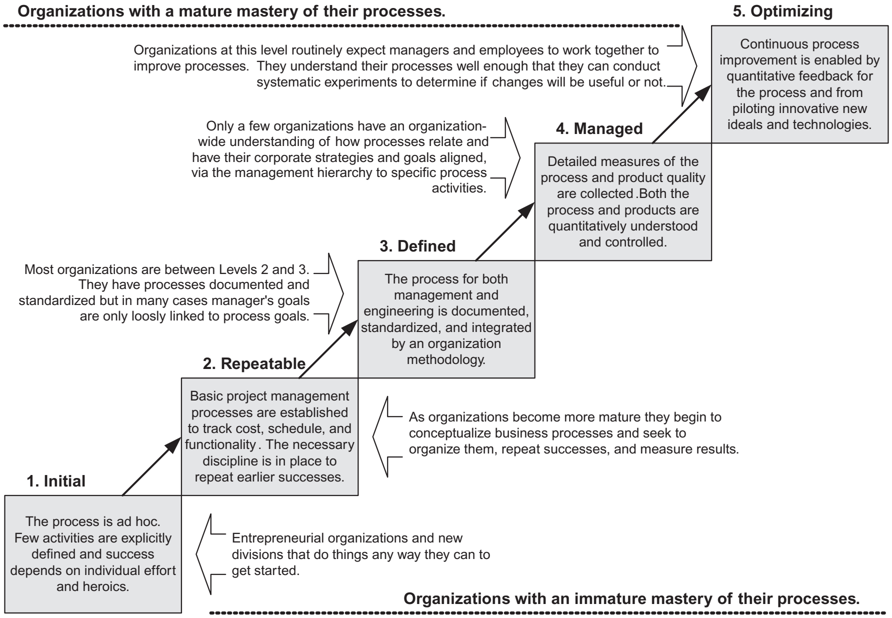

FIGURE I.3

The five levels of the Software Engineering Institute's Capability Maturity Model.

- *Level 3: Defined*. The process is documented for both management and engineering activities, and standards are defined. All projects use an approved, tailored version of the organization's standard approach to developing and maintaining software.
- *Level 4: Managed*. Detailed measures of the software process and product quality are collected. Both the software process and products are quantitatively understood and controlled.
- *Level 5: Optimizing*. Continuous process improvement is enabled by quantitative feedback from the process and from piloting innovative ideas and technologies.

The CMM approach is very much in the spirit of the Total Quality Management movement that was popular in engineering and manufacturing during the late 1980s. (The latest version of CMM is termed Capability Maturity Model Integration (CMMI). We will consider CMMI and some alternative process maturity models later in the book.)

Every organization can be assigned a maturity level. Most software organizations studied by SEI were in either Level 2 or 3. In effect, they had processes, but in most cases they were not as well defined as they could be. Their management systems were not well aligned with their processes, and they were not in a position to routinely improve their processes. Put a different way, most organizations today are focused on redesigning specific, departmental-level processes, and only beginning to move to a more comprehensive process architecture. Leading companies today, however, are focused on moving from Level 4 to level 5. They have created comprehensive business process architectures that describe how all the processes fit together (Level 3) and have then moved on to create management systems that measure process performance and assign specific managers with responsibilities for assuring that processes perform as necessary (Level 4). The best organizations have integrated management systems that automatically trigger process improvement efforts whenever there is a failure to achieve targeted process goals (Level 5). This progress reflects the concerns illustrated in Figure I.3.

In this book we will not make any assumptions about where your organization is today. We will, however, put lots of emphasis on how companies document processes, how they develop process architectures that describe how processes relate to each other, and how they align management systems to assure that corporate goals are aligned with managerial goals; and we will stress the importance of routine, continuous process improvement. In effect, this is a book that should help managers conceptualize where their organization should go and provide the tools they need to help with the transition.

The Variety of Options

If there were one way of handling all business process problems, we would be happy to elaborate it. Unfortunately, there are many different types of business process change problems. They vary by the organization's level of concern, industry, and the nature of the environmental change that needs to be accommodated. Some changes are undertaken to provide executives with the tools they need to manage a process-centric organization. Other changes only require modest improvements in existing processes. Still others require complete redesign of an existing process or the creation of a new process. Some focus on changes in how people perform, while others involve the use of software applications to automate a process. In some cases a software application can be purchased, and in other cases it must be developed and tailored for your specific needs. In a nutshell, there are many different ways to improve or redesign business processes. Managers face options. This book will provide you with an overview of all the options and describe the best practices available to help you choose the approach that is best for your situation.

The Variety of Solutions

One of the problems with the business process field is that various authors and vendors use the same terms in different ways. In this book we will use certain terms in very precise ways to avoid confusion.

Process improvement refers to relatively minor, specific changes that one makes in an existing business process. Every manager responsible for a process should always be considering process improvements. In addition, on occasion, special process improvement efforts are required to get everyone focused on improving a specific process. Six Sigma is a good example of a popular approach to process improvement.

Process design or redesign refers to a major effort that is undertaken to significantly improve an existing process or to create a new business process. Process redesign considers every aspect of a process and often results in changes in the sequence in which the process is done, in employee jobs, and in the introduction of automation. Business Process Reengineering, Business Transformation, the BPTrends Process Redesign methodology, and the Supply Chain Council's SCOR methodology are all good examples of popular approaches to process redesign.

Process automation refers to the use of computers and software applications to assist employees or to replace employees in the performance of a business process. The use of BPMS tools, workflow systems, or XML business process languages are ways to automate the management of processes or activities. Off-the-shelf ERP and CRM applications are also examples of automation. Similarly, software development methodologies like Rational Software's Unified Process or the Object Management Group's Model Driven Architecture are other examples of popular approaches to process automation.

Many authors use the term *BPM* to refer to process automation efforts. It is used to refer to the fact that, once processes are automated, the day-to-day execution of the process can be managed by means of software tools. Business executives, however, often use the term BPM in a more generic sense to refer to efforts on the part of business executives to organize and improve the human management of business processes. At the corporate level BPM is also used to refer to the development and maintenance of a business process architecture. We will use the term BPM in its most generic sense to refer to how business managers organize and control processes. When we want to use it in the more specialized sense to refer to automated systems, we will use the term "Business Process Management Software" or BPMS.

How This Book Is Organized

This book provides a pragmatic introduction to business process change. It is designed to provide managers with an overview of process concepts and best practices and to explain the options managers face as they seek to improve, redesign, or automate their business processes.

We will start with an overview of the kind of systematic business process improvement methodologies companies have used during the past decade. In effect, Chapter 1 will provide a brief history of business process change, just to assure we understand the basic options and are all using the same vocabulary.

The remainder of the book is divided into three major parts. Chapters 2 through 7 (Part I) consider organization-wide concerns. Chapters 8 through 14 (Part II) focus on process-level concerns. Then in Chapters 15 through 17 (Part III) we discuss implementation-level concerns. Chapter 18 pulls together all of these concerns and provides some final advice. Now let us consider this plan in a little more detail.

Part I: Organization-Wide Concerns

In Chapter 2 we consider how companies develop strategies, define goals, and generate business initiatives. This introduction to the strategic process will necessarily be rather general, but it will establish important themes, including ideas such as strategic positioning, value chains, and the importance of well-integrated processes for companies that want to achieve a competitive advantage.

In Chapter 3 we will discuss enterprise-level process concerns in a more practical way. We will introduce a business architecture methodology, and then consider what a company needs to do to develop a good basic understanding of the processes that make up an organization.

In Chapter 4 we will consider the nature of a business process architecture. In essence, it is the business process architecture that defines how the various business processes work together to create value. It is also the key to linking the organization's strategic goals to process goals and then to specific managerial goals. The business process architecture also provides a basis for prioritizing process change initiatives. And it provides the means by which business managers and IT managers can work together to establish a corporate software infrastructure and prioritize software development efforts. We will also discuss business process frameworks in this chapter and consider how they can help an organization in the rapid development of a business process architecture.

Chapter 5 will focus on measuring process performance. We will consider the development of a process performance measurement system in more detail. We will discuss the Balanced Scorecard systems that many companies use and see how it can be modified to support a more sophisticated process-monitoring system.

In Chapter 6, on process management, we will consider the role that the organization's managers play in organizing and maintaining an organization's business processes. We will also look at some frameworks that define best practices for process management.

In Chapter 7 we will examine the functions that an executive-level BPM group—or Process Center of Excellence—can provide. A BPM group can assist in all aspects of process change, and it can, in particular, serve as the center for prioritizing, planning, and coordinating a company's business process redesign or improvement projects.

Part II: Process-Level Concerns

In Chapter 8 we will provide a general introduction to the overall analysis of process problems. We will provide a basic approach to conceptualizing process problems and analyzing the nature of the gap between what is now and what kind of process you would like to create. Then we will use that knowledge to scope specific redesign or improvement projects.

In Chapter 9 we will pause to define the basic concepts and modeling techniques used to create business process diagrams. There are lots of ways of diagramming processes, and we have chosen the simplest we know about that are specifically designed for business managers. As automation has increasingly become a major part of any process redesign effort, there has been a tendency to discuss processes in the more technical terms that software analysts sometimes employ. We believe this is a serious mistake, since it makes it harder for average business managers to understand the processes that they are ultimately responsible for managing. We rely on a very simple way of modeling organizations and processes that assures that business managers can stay in control of the effort.

In Chapter 10 we drill down a bit further and consider what is involved in analyzing specific activities and defining the tasks or procedures that employees must follow and maintaining employee performance. We will also consider how we might define the decision models and business rules that employees use to make decisions as they perform specific activities.

Chapter 11 considers what is involved in day-to-day management of a business process. Unlike Chapter 6, which considers organization-wide process management issues, this chapter focuses on the specific activities that supervisors must master to be effective process managers.

Chapter 12 shifts and focuses on two specific process improvement methodologies, Lean and Six Sigma. Lean is derived from the Toyota Production System, and provides a way to streamline the flow of business work. Six Sigma is derived from operations research and provides a systematic way to measure and refine the output of specific processes. We do not go into the statistical techniques used in the Six Sigma process, but focus instead on the overall process and on how Six Sigma practitioners relate goals and measures to satisfying customers.

In Chapter 13 we discuss a methodology for systematically redesigning a business process. The BPTrends Process Redesign methodology we consider is one we use to provide a comprehensive introduction for those new to business process redesign. It combines and integrates all the techniques we have discussed in Part II. Our stress in this chapter is not only on process analysis and redesign, but on the other things one must do to assure the success of a project, including the organization and management of the project, the gathering of information and facilitation of discussions, and the communication and change management skills necessary to assure that others will join you in making the changed process a success.

Chapter 14 presents a major case study of a hypothetical car rental company that redesigns its car rental process using the approach, concepts, and techniques we have discussed in these chapters.

Part III: Implementation-Level Concerns

Chapter 15 is the first of three chapters that focus on business process software tools and automation. In Chapter 15 we begin with an overview of the types of software tools available to those who seek to redesign or automate business processes. We then proceed to consider the use of business process modeling tools and how they facilitate process analysis and redesign.

In Chapter 16 we shift and consider BPM suites, software tools that allow companies to manage the real-time execution of business processes on a day-to-day basis. These exciting new tools combine the best features of an earlier generation of workflow and EAI tools and offer a powerful way to help companies achieve new levels of integration and automation. And they rely on new Internet protocols and techniques like those embodied in service-oriented architecture and cloud architecture.

In Chapter 17 we focus on ERP applications, systems of software modules that companies can use to support or automate established business processes like inventory and accounting operations. We also consider some of the newer packaged applications used for CRM automation. In addition, we focus on the modeling languages commonly used for the design of ERP and CRM systems. We will conclude by considering how ERP and BPMS applications are likely to evolve in the near future. In Chapter 18 we will consider a group of new IT technologies, collectively known as Artificial Intelligence (AI) and consider how they will likely change business process redesigns in the near future. We will also consider how we might represent AI techniques in process modeling tools and conclude by considering how some AI techniques might affect the auto industry in the next few years.

Finally, in Chapter 19 we will try to pull together all the main points we make in this book. The chapter recapitulates the major options we have discussed and makes some suggestions about when each of the techniques is likely to be most effective. This book does not advocate a single methodology or a single set of practices to deal with business process change. Instead, we believe that business managers need to understand their options and then use the practices best suited to the specific problems they face.

We have included appendices on the nature of process problems, BPMN, and on various BPM standards to provide a succinct summary of some of the standards efforts underway.

Our goal was not to write a long book, but instead to create a book that a wide variety of managers could turn to when they needed information and insight on one or another aspect of their business process change. We hope this will serve as a guide and a tool for the business managers and process practitioners who will lead their companies through the changes that will challenge organizations in the decade ahead.

Notes and References

All references to anything published by BPTrends can be accessed on the BPTrends website: http://www.bptrends.com. All information on the BPTrends website is available without charge.

Specifically, BPTrends has published a series of surveys. To access the complete survey cited in this introductory chapter go to http://www.bptrends.com and click on the tab marked BPTrends Surveys.

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Chrissis, Mary Beth, Mike Konrad, and Sandy Shrum. *CMMI: Second Edition: Guidelines for Process Integration and Product Improvement*. Addison-Wesley, 2007. This book provides a summary of where CMMI is today.

CHAPTER

Business process change

1

This chapter provides a brief history of corporate business process change initiatives. Individuals working in one tradition, whether business process reengineering (BPR), Six Sigma, or enterprise resource planning (ERP), often imagine that their perspective is the only one, or the correct one. We want to provide managers with several different perspectives on business process change to give everyone an idea of the range of techniques and methodologies available today. At the same time we will define some of the key terms that will be used throughout the remainder of the book.

People have always worked at improving processes. Some archeologists find it useful to organize their understanding of early human cultural development by classifying the techniques and processes that potters used to create their wares. In essence, potters gradually refined the pot-making process, creating better products, while probably also learning how to make them faster and cheaper.

The Industrial Revolution that began in the late 18th century led to factories and managers who focused considerable energy on the organization of manufacturing processes. Any history of industrial development will recount numerous stories of entrepreneurs who changed processes and revolutionized an industry. In the introduction we mentioned how Henry Ford created a new manufacturing process and revolutionized the way automobiles were assembled. He did that in 1903.

In 1911, soon after Henry Ford launched the Ford Motor Company, another American, Frederick Winslow Taylor, published a seminal book: *Principles of Scientific Management*. Taylor sought to capture some of the key ideas that good managers used to improve processes. He argued for simplification, for time studies, for systematic experimentation to identify the best way of performing a task, and for control systems that measured and rewarded output. Taylor's book became an international bestseller, and many would regard him as the father of operations research, a branch of engineering that seeks to create efficient and consistent processes. From 1911 on, managers have sought ways to be more systematic in their approaches to process change.

New technologies have often led to new business processes. The introduction of the train, the automobile, the radio, the telephone, and television, has each led to new and improved business processes. Since the end of World War II computers and software systems have provided a major source of new efficiencies.

Two recent developments in management theory deserve special attention. One was the popularization of systems thinking, and the other was the formalization of the idea of a value chain.

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Organizations as Systems

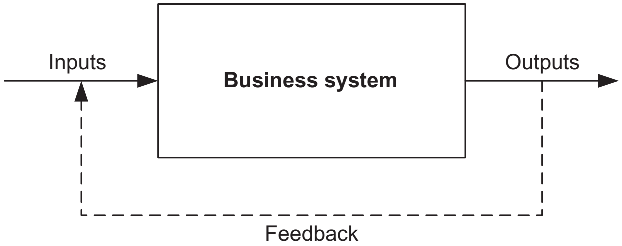

FIGURE 1.1

Business entity as a system.

Many different trends led to the growing focus on systems that began in the 1960s. Some derived from operations research and studies of control systems. Some resulted from the emphasis on systems current in the computer community. Today's emphasis on systems also arose out of contemporary work in biology and the social sciences. At the same time, however, many management theorists have contributed to the systems perspective. One thinks of earlier writers like Ludwig von Bertalanffy, Stafford Beer, and Jay W. Forrester and more recent management theorists like John D. Sterman and Peter M. Senge.

In essence, the systems perspective emphasizes that everything is connected to everything else and that it is often worthwhile to model businesses and processes in terms of flows and feedback loops. A simple systems diagram is shown in Figure 1.1.

The idea of treating a business as a system is so simple, especially today when it is so commonplace, that it is hard for some to understand how important the idea really is. Systems thinking stresses linkages and relationships and flows. It emphasizes that any given employee or unit or activity is part of a larger entity and that ultimately those entities, working together, are justified by the results they produce.

To make all this a bit more concrete, consider how it is applied to business processes in the work of Michael E. Porter.

Systems and Value Chains

The groundwork for the current emphasis on comprehensive business processes was laid by Michael Porter in his 1985 book, *Competitive Advantage: Creating and Sustaining Superior Performance*. Porter is probably best known for his earlier book, *Competitive Strategy*, published in 1980, but it is in *Competitive Advantage* that he lays out his concept of a *value chain*—a comprehensive collection of all the activities that are performed to design, produce, market, deliver, and support a product line. Figure 1.2 shows the diagram that Porter has used on several occasions to illustrate a generic value chain.

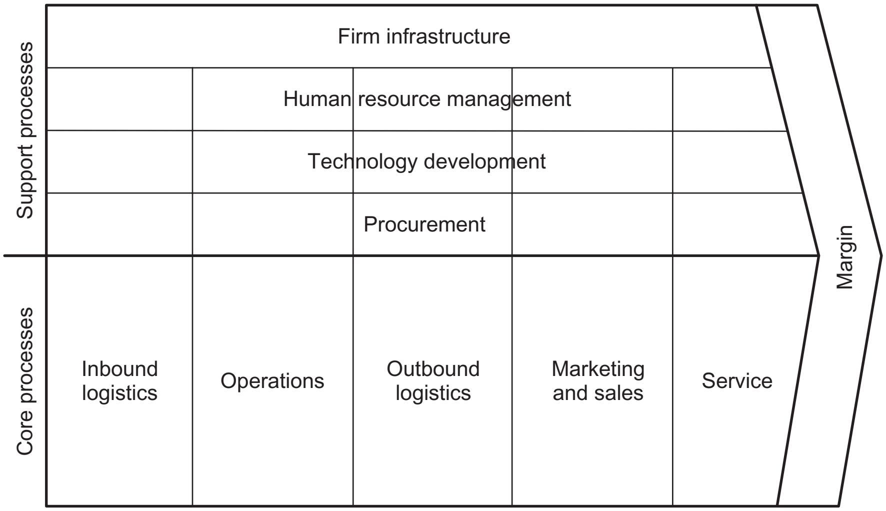

FIGURE 1.2

Michael Porter's generic value chain.

Although Porter does not show it on this diagram, you should assume that some primary activity is initiated on the lower left of the diagram when a customer orders a product, and ends on the right side when the product is delivered to the customer. Of course, it may be a bit more complex, with marketing stimulating the customer to order and service following up the delivery of the order with various activities, but those details are avoided in this diagram. Figure 1.2 simply focuses on what happens between the order and the final delivery—on the value chain or the large-scale business process that produces the product. What is important to Porter's concept is that every function involved in the production of the product, and all the support services, from IT to accounting, should be included in a single value chain. It is only by including all the activities involved in producing the product that a company is in a position to determine exactly what the product is costing and what margin the firm achieves when it sells the product.

As a result of Porter's work, a new approach to accounting, *Activity-Based Costing*, has become popular and is used to determine the actual value of producing specific products.

Geary Rummler was the second major business process guru of the 1980s. With a background in business management and behavioral psychology, Rummler worked for years on employee training and motivation issues. Eventually, Rummler and his colleagues established a specialized discipline that is usually termed *Human Performance Technology*. Rummler's specific focus was on how to structure processes and activities to guarantee that employees—be they managers, salespeople, or production line workers—would function effectively. In the 1960s and 1970s he relied on behavioral psychology and systems theory to explain his approach, but during the course of the 1980s he focused increasingly on business process models.

When Porter's concept of a value chain is applied to a business organization a different type of diagram is produced. Figure 1.3 illustrates a value chain or business process that cuts across five departmental or functional boundaries, represented by the underlying organizational chart. The boxes shown within the process arrow are subprocesses. The subprocesses are initiated by an input from a customer, and the process ultimately produces an output that is consumed by a customer. As far as I know, this type of diagram was first used by another management systems theorist, Geary Rummler, in 1984.

This can all get confusing, so it's worth taking a moment to be clear. Either a system or a process converts inputs into outputs. In effect, a business process is just one type of system. Similarly, we can think of a business organization as a system, or as a type of large business process. A business organization takes various types of inputs (e.g., materials, parts, etc.) and converts them into products or services that are sold (output) to customers. If a business organization is relatively simple and only has one value chain—if, in other words, the organization only creates one line of products or services—then the business organization is itself a value chain, and both are processes. If a business organization contains more than one value chain, then the business organization is a process and it has two or more value chains as subprocesses.

At the end of the 1980s Rummler and a colleague, Alan Brache, wrote a book, *Improving Performance: How to Manage the White Space on the Organization Chart*, which described the approach they had developed while consulting on process improvement during that decade. Rummler focused on organizations as systems and worked from the top down to develop a comprehensive picture of how organizations were defined by processes and how people defined what processes could accomplish.

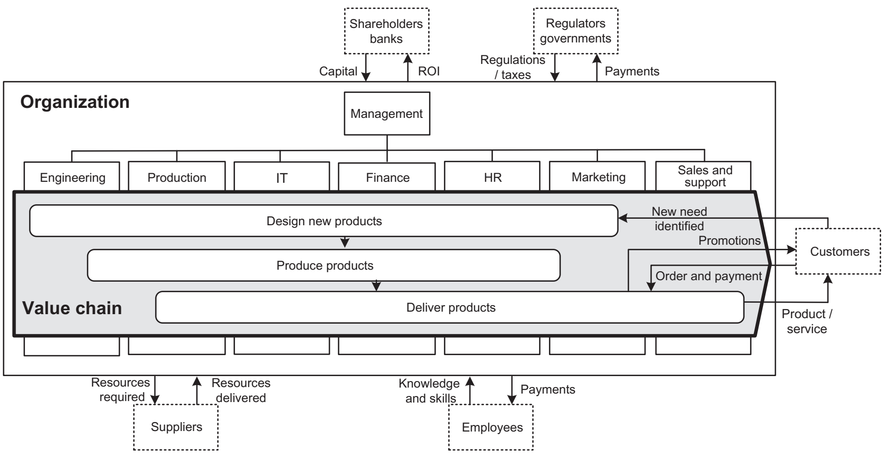

FIGURE 1.3

A business process cuts across traditional departments to combine activities into a single process flow.

He provided a detailed methodology for how to analyze an organization, how to analyze processes, how to redesign and then improve processes, how to design jobs, and how to manage processes once they were in place. The emphasis on "the white space on the organization chart" stressed the fact that many process problems occurred when one department tried to hand off things to the next. The only way to overcome those interdepartmental problems, Rummler argued, was to conceptualize and manage processes as wholes.

Later, in the 1990s Hammer and Davenport would exhort companies to change and offered many examples about how changes had led to improved company performance. Similarly, IDS Scheer would offer a software engineering methodology for process change. Rummler and Brache offered a systematic, comprehensive approach designed for business managers. The book that Rummler and Brache wrote did not launch the BPR movement in the 1990s. The popular books written by Hammer and Davenport launched the reengineering movement. Once managers became interested in reengineering, however, and began to look around for practical advice about how to actually accomplish process change, they frequently arrived at *Improving Performance*. Thus, the Rummler-Brache methodology became the most widely used systematic business process methodology in the mid-1990s.

One of the most important contributions made by Rummler and Brache was a framework that showed, in a single diagram, how everything related to everything else. They define three levels of performance: (1) an organizational level, (2) a process level, and (3) a job or performer level. This is very similar to the levels of concern we will describe in a bit, except that we refer to level (3) as the implementation or resource level to emphasize that an activity can be performed by an employee doing a job, by a machine or robot, or by a computer executing a software application.

	Goals and measures	**Design and implementation**	**Management**
Organizational level	Organizational goals and measures of organizational success	Organizational design and implementation	Organizational management
Process level	Process goals and measures of process success	Process design and implementation	Process management
Activity or performance level	Activity goals and measures of activity success	Activity design and implementation	Activity management

FIGURE 1.4

Performance framework.

Modified from a figure in Rummler and Brache's Performance Improvement.

Otherwise, our use of levels of concern in this book mirrors the levels described in Rummler-Brache in 1990 (see Figure 1.4).

Notice how similar the ideas expressed in the Rummler-Brache framework are to the ideas expressed in the Software Engineering Institute (SEI) Capability Maturity Model (CMM) we considered in the introduction. Both seek to describe an organization that is mature and capable of taking advantage of systematic processes. Both stress that we must be concerned not only with the design of processes themselves, but also with measures of success and with the management of processes. In effect, the CMM diagram describes how organizations evolve toward process maturity, and the Rummler-Brache framework describes all the things that a mature organization must master.

Mature organizations must align both vertically and horizontally. Activity goals must be related to process goals, which must in turn be derived from the strategic goals of the organization. Similarly, a process must be an integrated whole, with goals and measures, a good design that is well implemented, and a management system that uses the goals and measures to ensure that the process runs smoothly and, if need be, is improved.

The Rummler-Brache methodology has helped everyone involved in business process change to understand the scope of the problem, and it provides the foundation on which all of today's comprehensive process redesign methodologies are based.

Prior to the work of systems and management theorists like Porter and Rummler, most companies had focused on dividing processes into specific activities that were assigned to specific departments. Each department developed its own standards and procedures to manage the activities delegated to it. Along the way, in many cases, departments became focused on doing their own activities in their own way, without much regard for the overall process. This is often referred to as *silo thinking*, an image that suggests that each department on the organization chart is its own isolated silo.

In the early years of business computing a sharp distinction was made between corporate computing and departmental computing. A few systems like payroll and accounting were developed and maintained at the corporate level. Other systems were created by individual departments to serve their specific needs. Typically, one departmental system would not talk to another, and the data stored in the databases of sales could not be exchanged with data in the databases owned by accounting or by manufacturing. In essence, in an effort to make each department as professional and efficient as possible the concept of the overall process was lost.

The emphasis on value chains and systems in the 1980s and the emphasis on BPR in the early 1990s was a revolt against excessive departmentalism and a call for a more holistic view of how activities needed to work together to achieve organizational goals.

The Six Sigma Movement

The third main development in the 1980s evolved from the interaction of the Rummler-Brache approach and the quality control movement. In the early 1980s Rummler had done quite a bit of consulting at Motorola and had helped Motorola University set up several courses in process analysis and redesign. In the mid-1980s a group of quality control experts wedded Rummler's emphasis on process with quality and measurement concepts derived from quality control gurus W. Edwards Deming and Joseph M. Juran to create a movement that is now universally referred to as Six Sigma. Six Sigma is more than a set of techniques, however. As Six Sigma spread, first from Motorola to GE, and then to a number of other manufacturing companies, it developed into a comprehensive training program that sought to create process awareness on the part of all employees in an organization. Organizations that embrace Six Sigma not only learn to use a variety of Six Sigma tools, but also embrace a whole culture dedicated to training employees to support process change throughout the organization.

Prior to Six Sigma, quality control professionals had explored a number of different process improvement techniques. ISO 9000 is a good example of another quality control initiative. This international standard describes activities organizations should undertake to be certified ISO 9000 compliant. Unfortunately, ISO 9000 efforts usually focus on simply documenting and managing procedures. Recently, a newer version of this standard, ISO 9000:2000, has become established. Rather than focusing so much on documentation the new standard is driving many companies to think in terms of processes. In many cases this has prompted management to actually start to analyze processes and use them to start to drive change programs. In both cases, however, the emphasis is on documentation and measurement while what organizations really need are ways to improve quality.

At the same time that companies were exploring ISO 9000 they were also exploring other quality initiatives like statistical process control, total quality management, and just-in-time manufacturing. Each of these quality control initiatives contributed to the efficiency and quality of organizational processes. All this jelled at Motorola with Six Sigma, which has evolved into the most popular corporate process movement today. Unfortunately, Six Sigma's origins in quality control and its heavy emphasis on statistical techniques and process improvement have often put it at odds with other, less statistical approaches to process redesign, like the Rummler-Brache methodology, and with process automation. That, however, is beginning to change, and today Six Sigma groups in leading corporations are reaching out to explore the whole range of business process change techniques. This book is not written from a traditional Six Sigma perspective, but we believe that Six Sigma practitioners will find the ideas described here useful and we are equally convinced that readers from other traditions will find it increasingly important and useful to collaborate with Six Sigma practitioners.

Business Process Change in the 1990s

Much of the current corporate interest in business process change can be dated from the BPR movement that began in 1990 with the publication of two papers: Michael Hammer's "Reengineering Work: Don't Automate, Obliterate" (*Harvard Business Review*, July/August 1990) and Thomas Davenport and James Short's "The New Industrial Engineering: Information Technology and Business Process Redesign" (*Sloan Management Review*, Summer 1990). Later, in 1993, Davenport wrote a book, *Process Innovation: Reengineering Work through Information Technology*, and Michael Hammer joined with James Champy to write *Reengineering the Corporation: A Manifesto for Business Revolution*.

BPR theorists like Champy, Davenport, and Hammer insisted that companies must think in terms of comprehensive processes, similar to Porter's value chains and Rummler's organization level. If a company focused only on new product development, for example, the company might improve the new product development subprocess, but it might not improve the overall process. Worse, one might improve new product development at the expense of the overall value chain. If, for example, new process development instituted a system of checks to ensure higher quality documents, it might produce superior reports, but take longer to produce them, delaying marketing and manufacturing's ability to respond to sudden changes in the marketplace. Or the new reports might be organized in such a way that they made better sense to the new process development engineers, but became much harder for marketing or manufacturing readers to understand.

Stressing the comprehensive nature of business processes, BPR theorists urged companies to define all of their major processes and then focus on the processes that offered the most return on improvement efforts. Companies that followed this approach usually conceptualized a single business process for an entire product line, and ended up with only 5–10 value chains for an entire company, or division, if the company was very large. The good news is that if companies followed this advice, they were focusing on everything involved in a process and were more likely to identify ways to significantly improve the overall process. The bad news is that when one conceptualizes processes in this way, one is forced to tackle very large redesign efforts that typically involve hundreds or thousands of workers and dozens of major IT applications.

BPR was more than an emphasis on redesigning large-scale business processes. The driving idea behind the BPR movement was best expressed by Thomas Davenport, who argued that IT had made major strides in the 1980s, and was now capable of creating major improvements in business processes. Davenport's more reasoned analysis, however, did not get nearly the attention that Michael Hammer attracted with his more colorful rhetoric.

Hammer argued that previous generations of managers had settled for using information technologies to simply improve departmental functions. In most cases the departmental functions had not been redesigned but simply automated. Hammer referred to this as "paving over cow paths." In many cases, he went on to say, departmental efficiencies were maximized at the expense of the overall process. Thus, for example, a financial department might use a computer to ensure more accurate and up-to-date accounting records by requiring manufacturing to turn in reports on the status of the production process. In fact, however, many of the reports came at inconvenient times and actually slowed down the manufacturing process. In a similar way, sales might initiate a sales campaign that resulted in sales that manufacturing could not produce in the time allowed. Or manufacturing might initiate changes in the product that made it easier and more inexpensive to manufacture, but which made it harder for salespeople to sell. What was needed, Hammer argued, was a completely new look at business processes. In most cases, Hammer argued that the existing processes should be "obliterated" and replaced by totally new processes, designed from the ground up to take advantage of the latest information system technologies. Hammer promised huge improvements if companies were able to stand the pain of such comprehensive BPR.

In addition to his call for total process reengineering, Hammer joined Davenport in arguing that processes should be integrated in ways they had not been in the past. Hammer argued that the economist Adam Smith had begun the movement toward increasingly specialized work. Readers will probably all recall that Adam Smith analyzed data on pin manufacture in France in the late 18th century. He showed that one man, working alone, could create a given number of straight pins in a day. But a team, each doing only one part of the task, could produce many times the number of pins per day that the individual members of the team could produce, each working alone. In other words, the division of labor paid off with handsome increases in productivity. In essence, Ford had only been applying Smith's principle to automobile production when he set up his continuous production line in Michigan in the early 20th century. Hammer, however, argued that Smith's principle had led to departments and functions that each tried to maximize its own efficiency at the expense of the whole. In essence, Hammer claimed that large companies had become more inefficient by becoming larger and more specialized. The solution, according to Hammer, Davenport, and Champy, was twofold: First, processes needed to be conceptualized as complete, comprehensive entities that stretched from the initial order to the delivery of the product. Second, IT needed to be used to integrate these comprehensive processes.

As a broad generalization the process initiatives, like Six Sigma and Rummler-Brache, that began in the 1980s put most of their emphasis on improving how people performed while BPR in the 1990s put most of the emphasis on using IT more effectively and on automating processes wherever possible.

The Role of IT in BPR

Both Hammer and Davenport had been involved in major process improvement projects in the late 1980s and observed how IT applications could cut across departmental lines to eliminate inefficiencies and yield huge gains in coordination. They described some of these projects and urged managers at other companies to be equally bold in pursuing similar gains in productivity.

In spite of their insistence on the use of IT, however, Hammer and his colleagues feared the influence of IT professionals. Hammer argued that IT professionals were usually too constrained by their existing systems to recognize major new opportunities. He suggested that IT professionals usually emphasized what could not be done rather than focusing on breakthroughs that could be achieved. To remedy this, Hammer and Champy argued that the initial business process redesign teams should exclude IT professionals. In essence, they argue that the initial BPR team should consist of business managers and workers who would have to implement the redesigned process. Only after the redesign team had decided how to change the entire process, Hammer argued, should IT people be called in to advise the team on the systems aspects of the proposed changes.

In hindsight, one can see that the BPR theorists of the early 1990s underestimated the difficulties of integrating corporate systems with the IT technologies available at that time. The BPR gurus had watched some large companies achieve significant results, but they failed to appreciate that the sophisticated teams of software developers available to leading companies were not widely available. Moreover, they failed to appreciate the problems involved in scaling up some of the solutions they recommended. And they certainly compounded the problem by recommending that business managers redesign processes without the close cooperation of their IT professionals. It is true that some IT people resisted major changes, but in many cases they did so because they realized, better than most business managers, just how much such changes would cost. Worse, they realized that many of the proposed changes could not be successfully implemented at their companies with the technologies and personnel they had available.

Some of the BPR projects undertaken in the mid-1990s succeeded and produced impressive gains in productivity. Many others failed and produced disillusionment with BPR. Most company managers intuitively scaled down their BPR efforts and did not attempt anything as large or comprehensive as the types of projects recommended in the early BPR books.

The Misuses of BPR

During this same period many companies pursued other goals under the name of BPR. Downsizing was popular in the early to mid-1990s. Some of it was justified. Many companies had layers of managers whose primary function was to organize information from line activities and then funnel it to senior managers. The introduction of new software systems and tools that made it possible to query databases for information also meant that senior managers could obtain information without the need for so many middle-level managers. On the other hand, much of the downsizing was simply a natural reduction of staff in response to a slowdown in the business cycle. The latter was appropriate, but it led many employees to assume that any BPR effort would result in major reductions in staff.

Because of some widely discussed failures, and also as a result of employee distrust, the term BPR became unpopular during the late 1990s and has gradually fallen into disuse. As an alternative, most companies began to refer to their current business process projects as "business process improvement" or "business process redesign." Recently, the term "digital transformation" has become popular. It emphasizes the importance of the use of IT techniques in business process redesign, and to a lesser degree an emphasis on using new technologies to introduce discontinuous changes that require that the business be reconceptualized in major ways.

Lean and the Toyota Production System

Independent of BPR a totally separate approach to business process improvement, popularly called "Lean," also started to became popular in the 1990s. In the late 1980s a team of MIT professors visited Japan to study Japanese auto-manufacturing processes. In 1990 James Womack, Daniel Jones, and Daniel Roos published a book, *The Machine That Changed the World: The Story of Lean Production*. In essence, the authors reported that what they saw at the Toyota factories in Japan was so revolutionary that it deserved emulation in the West. Since this first report, process people throughout the world have studied the Toyota approach, which is now generally termed the Toyota Production System (TPS). In the initial book Womack, Jones, and Roos tended to emphasize Toyota's process improvement methods, which included a careful study of each activity in a process stream to determine if the activity did or did not add value to the final product. Lean practitioners referred to the various ways in which activities failed to add value as forms of waste (*muta* in Japanese), and soon process people were talking about the seven types of waste, or perhaps the eight types, depending on who you read.

Now that two decades have passed, now that Toyota has factories in the United States and has become the largest auto producer in the world, and dozens of books have been published on Lean and TPS, we have a broader understanding of the entire Toyota approach to process improvement. The TPS starts with the CEO and permeates the entire organization. In essence, all the managers and employees at the Toyota plants are constantly focused on improving the organization's business processes. Today, Lean is even more popular than it was in the 1990s, although many think of Lean rather narrowly and have not yet fully understood the comprehensive nature of the TPS approach. At the same time many Six Sigma groups have attempted to combine Lean and Six Sigma into a single approach.

Other Process Change Work in the 1990s

Many of the approaches to business process redesign that emerged in the mid- to late 1990s were driven by software technologies. Some companies used software applications, called *workflow systems*, to automate business processes. In essence, early workflow systems controlled the flow of documents from one employee to another. The original document was scanned into a computer. Then, an electronic copy of the document was sent to the desk of any employees who needed to see or approve the document. To design workflow systems one created a flow plan, like the diagram shown in Figure 1.3, that specified how the document moved from one employee to the next. The workflow system developers or managers could control the order that electronic documents showed up on employees' computers by modifying the diagram. Workflow systems became a very popular way to automate document-based processes. Unfortunately, in the early 1990s most workflow systems were limited to automating departmental processes and could not scale up to enterprise-wide processes.

During this same period vendors of off-the-shelf software applications began to organize their application modules so that they could be represented as a business process. In effect, one could diagram a business process by simply deciding how to link a number of application modules. Vendors like SAP, PeopleSoft, Oracle, and JD Edwards all offered systems of this kind, which were usually called ERP systems. In effect, a business analyst was shown an ideal way that several modules could be linked together. A specific company could elect to eliminate some modules and change some of the rules controlling the actions of some of the modules, but overall one was limited to choosing and ordering existing software application modules. Many of the modules included customer interface screens and therefore controlled employee behaviors relative to particular modules. In essence, an ERP system is controlled by another kind of "workflow" system. Instead of moving documents from one employee workstation to another the ERP systems offered by SAP and others allowed managers to design processes that moved information and control from one software module to another. ERP systems allowed companies to replace older software applications with new applications, and to organize the new applications into an organized business process. This worked best for processes that were well understood and common between companies. Thus, accounting, inventory, and human resource processes were all popular targets for ERP systems.

SAP, for example, offers the following modules in their financials suite: Change Vendor or Customer Master Data, Clear Open Items, Deduction Management, Payment with Advice, Clearing of Open Items at Vendor, Reporting for External Business Partners, and SEM: Benchmark Data Collection. They also offer "blueprints," which are in essence alternative flow diagrams showing how the financial modules might be assembled to accomplish different business processes.

Davenport supported and promoted the use of ERP packaged applications as a way to improve business processes. At the same time, August-Wilhelm Scheer, a software systems theorist, advocated the use of ERP applications for systems development, and wrote several books promoting this approach and the use of a modeling methodology that he named ARIS.

Most large companies explored the use of document workflow systems and the use of ERP systems to automate at least some business processes. The use of document workflow and ERP systems represented a very different approach to process redesign than that advocated by the BPR gurus of the early 1990s. Gurus like Hammer had advocated a total reconceptualization of complete value chains. Everything was to be reconsidered and redesigned to provide the company with the best possible new business process. The workflow and ERP approaches, on the other hand, focused on automating existing processes and replacing existing, departmentally focused legacy systems with new software modules that were designed to work together. These systems were narrowly focused and relied heavily on IT people to put them in place. They provided small-scale improvements rather than radical redesigns.

We have already considered two popular software approaches to automating business processes: workflow and the use of systems of ERP applications. Moving beyond these specific techniques, any software development effort could be a response to a business process challenge. Any company that seeks to improve a process will at least want to consider if the process can be automated. Some processes cannot be automated with existing technology. Some activities require people to make decisions or to provide a human interface with customers. Over the course of the past few decades, however, a major trend has been to increase the number of tasks performed by computers. As a strong generalization, automated processes reduce labor costs and improve corporate performance.

Software engineering usually refers to efforts to make the development of software more systematic, efficient, and consistent. Increasingly, software engineers have focused on improving their own processes and on developing tools that will enable them to assist business managers to automate business processes. We mentioned the work of the SEI at Carnegie Mellon University on CMM, a model that describes how organizations mature in their use and management of processes.

At the same time, software engineers have developed modeling languages for modeling software applications and tools that can generate code from software models. Some software theorists have advocated developing models and tools that would allow business analysts to be more heavily involved in designing the software, but to date this approach has been limited by the very technical and precise nature of software specifications. As an alternative, a good deal of effort has been focused on refining the concept of *software requirements*—the specification that a business process team would hand to a software development team to indicate exactly what a software application would need to do to support a new process.

The more complex and important the business process change, the more likely a company will need to create tailored software to capture unique company competencies. Whenever this occurs, then languages and tools that communicate between business process teams and IT teams become very important.

The Internet

In the early 1990s, when Hammer and Davenport wrote their BPR books, the most popular technique for large-scale corporate systems integration was electronic data interchange (EDI). Many large companies used EDI to link with their suppliers. In general, however, EDI was difficult to install and expensive to maintain. As a practical matter, EDI could only be used to link a company to its major suppliers. Smaller suppliers could not afford to install EDI and did not have the programmers required to maintain an EDI system.

By the late 1990s, when enthusiasm for BPR was declining and at the same time that companies began to explore workflow and ERP approaches, new software technologies began to emerge that really could deliver on the promise that the early BPR gurus had oversold. Among the best known are the Internet, email, and the Web, which provide powerful ways to facilitate interactions between employees, suppliers, and customers.

The Internet does not require proprietary lines, but runs instead on ordinary telephone lines and increasingly operates in a wireless mode. At the same time, the Internet depends on popular, open protocols that were developed by the government and were widely accepted by everyone. A small company could link to the Internet and to a distributor or supplier in exactly the same way that millions of individuals could surf the Web, by simply acquiring a PC and a modem and using browser software. Just as the Internet provided a practical solution for some of the communications problems faced by companies, email and the Web created a new way for customers to communicate with companies. In the late 1990s customers rapidly acquired the habit of going to company websites to find out what products and services were available. Moreover, as fast as companies installed websites that would support it, customers began to buy products on line. In effect, the overnight popularity of the Internet, email, and the Web in the late 1990s made it imperative that companies reconsider how they had their business processes organized to take advantage of the major cost savings that the use of the Internet, Web, and email could provide. As additional products from wireless iPads to smartphones have proliferated in the first decade of the 21st century the ways in which employees and customers can interact with businesses have grown exponentially, requiring almost all business processes to be reconsidered.

Of course, the story is more complex. A number of dot.com companies sprang up, promising to totally change the way companies did business by using the Internet, Web, and email. Some, like Amazon and Apple's iTunes, have revolutionized major industries. Most early dot.com companies, however, disappeared when the stock market realized that their business models were unsound.

In the nearly two decades since the dot.com companies were a business sensation, Internet-based applications (apps) of all kinds have proliferated and completely changed our lives. One thinks of social media like Google and Facebook and whole ecosystems of interrelated web applications that provide us maps and driving directions, online books, and various smartphone apps of all kinds. These various apps provide challenges for process designers that we will consider in later chapters.

A Quick Summary

Figure 1.5 provides an overview of some of the historical business process technologies we have described in this chapter. Most are still actively evolving. As you can see in the figure, business process management has evolved from a diverse

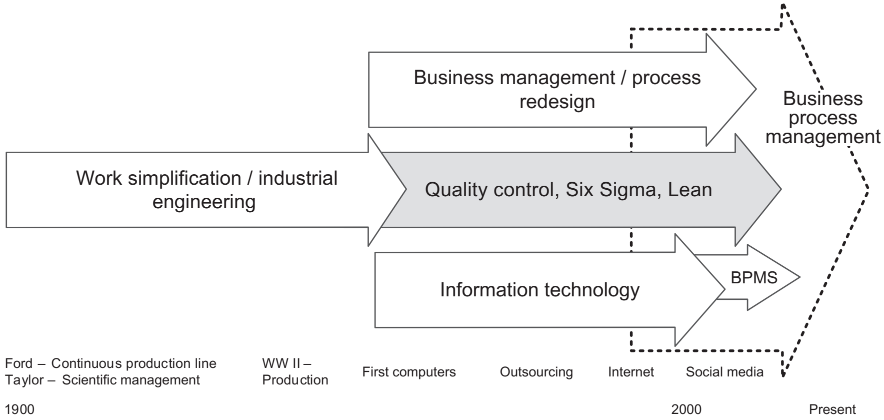

FIGURE 1.5

Three business process traditions.

collection of ideas and traditions. We have grouped them very loosely into three general traditions: (1) the Industrial Engineering/Quality Control tradition, which is primarily focused on improving operational processes, (2) the Management and Business Process Redesign tradition, which is focused on aligning or changing major business processes to significantly improve organizational performance, and (3) the IT tradition, which is primarily focused on process automation. Most large companies have groups working in each of these traditions, and increasingly the different traditions are borrowing from each other. And, of course, none of the groups has confined itself to a single tradition. Thus, Lean Six Sigma is focused on process improvement, but it also supports process management and process redesign initiatives. Similarly, IT is focused on automation, but IT process groups are often heavily involved in process redesign projects and are strongly committed to architecture initiatives that incorporate business process architectures.

The author of this book comes from the Management and Process Redesign tradition—he began his process work as an employee of a consulting company managed by Geary Rummler—and this book describes that tradition in more detail than any other. However, the author has worked with enough different companies to know that no solution fits every situation. Thus, he is firmly committed to a best-practices approach that seeks to combine the best from all the process change traditions and provides information on the other traditions whenever possible to encourage the evolving synthesis of the different process traditions. Senior managers do not make the fine distinctions that we illustrate in Figure 1.5. Executives are interested in results, and, increasingly, effective solutions require practitioners from the different traditions to work together. Indeed, one could easily argue that the term “business process management” was coined to suggest the emergence of a more synthetic, comprehensive approach to process change that combines the best of process management, redesign, process improvement, and process automation.

Business Process Change in the New Millennium

For a while the new millennium did not seem all that exciting. Computer systems did not shut down as the year 2000 began. The collapse of the dot.com market and a recession seemed to provide a brief respite from the hectic business environment of the 1990s. By 2002, however, the sense of relentless change had resurfaced.

The corporate interest in business process change, which seemed to die down a bit toward the end of the 20th century, resurfaced with a vengeance. Many people working in IT realized that they could integrate a number of diverse technologies that had been developed in the late 1990s to create a powerful new approach to facilitate the day-to-day management of business processes. The book that best reflected this new approach was called *Business Process Management: The Third Wave* by Howard Smith and Peter Fingar. They proposed that companies combine workflow systems, software applications integration systems, and Internet technologies to create a new type of software application. In essence, the new software—business process management software (BPMS)—would coordinate the day-to-day activities of both employees and software applications. The BPMS applications would use process models to define their functionality, and make it possible for business managers to change their processes by changing the models or rules that directed the BPMS applications. All of these ideas had been tried before, with earlier technologies, but in 2003 it all seemed to come together, and dozens of vendors rushed to create BPMS products. As the enthusiasm spread the vision was expanded and other technologists began to suggest how BPMS applications could drive management dashboards that would let managers control processes in something close to real time. A decade later, process mining promised help in the analysis of information flows within organizations and new analytic tools offered ways to search the huge databases generated by the use of email and even newer mobile devices, and to generate ongoing advice to management. As each new technology has been brought to market the BPMS tools have become even more powerful and flexible.

In 2002 there were no BPM conferences in the United States. In 2012 there were a dozen BPM meetings in the nation, and the first major international BPM conference was held in China. In 2003 Gartner suggested that BPMS vendors earned around $500 million. In 2007 Gartner projected the market for BPMS products would exceed $1 billion by 2009. In 2012 Gartner projected a market of $2.6 billion, while the ever-optimistic Forrester projected the market at $6.3 billion.

Were everyone only excited about BPMS then we might suggest that the market was simply a software market, but that was hardly the case. All the various aspects of business process have advanced during the same period. Suddenly large companies were making major investments in the creation of business process architectures. To create these architectures they sought to define and align their processes while simultaneously defining metrics to measure process success. Similarly, there was a broad movement toward reorganizing managers to support process goals. The Balanced Scorecard played a major role in this. There has been renewed interest in using maturity models to evaluate corporate progress. A number of industry groups have defined business process frameworks, like the Supply Chain Council's SCOR, the TeleManagement Forum's eTOM, and the APQC's business process frameworks, and management has adopted these frameworks to speed the development of enterprise-level architectures and measurement systems.

Process redesign and improvement have also enjoyed a renaissance, and Six Sigma has expanded from manufacturing to every possible industry while simultaneously incorporating Lean. A dozen new process redesign methodologies and notations have been published in the past few years, and more than 200 books on the various aspects of process change have been published. It is hard to find a business publication that is not talking about the importance of process change. Clearly this interest in business process change is not driven by just BPMS or by any other specific technology. Instead, it was being driven by the deeper needs of the business managers in the 2000s. This enthusiasm continued till 2007 when an economic recession slowed things down a bit. A recovery is now underway, supported by all the concerns of the early 2000s and encouraged by new innovations in AI and social media that will require major investments in new business process redesign efforts in the years ahead.

What Drives Business Process Change?

So far, we have spoken of various approaches to business process change. To wrap up this discussion, perhaps we should step back and ask what drives the business interest in business processes in the first place. The perennial answers are very straightforward. In economically bad times, when money is tight, companies seek to make their processes more efficient to save money. In economically good times, when money is more available, companies seek to expand to ramp up production and to enter new markets. They improve processes to offer better products and services in hopes of attracting new customers or taking customers away from competitors.

Since the 1980s, however, the interest in process has become more intense. The new interest in process is driven by change. Starting in the 1980s, large US companies became more engaged in world trade. At the same time, foreign companies began to show up in the United States and compete with established market leaders. Thus, in the 1970s most Americans who wanted to buy a car chose among cars sold by General Motors, Ford, and Chrysler. By the mid-1980s Americans were just as likely to consider a VW, a BMW, a Nissan, or a Honda. Suddenly, the automobile market had moved from a continental market to a world market. This development has driven constant changes in the auto market and it is not about to let up in the next few years as auto companies throughout the world race to shift from cars with gasoline engines to cars powered by electric engines.

Increased competition also led to mergers and acquisitions, as companies attempted to acquire the skills and technologies they needed to control their markets or enter new ones. Every merger between rivals in the same industry creates a company with two different sets of processes, and someone has to figure out which processes the combined company will use going forward.

During this same period, IT technology was remaking the world. The first personal computers appeared at the beginning of the 1980s. The availability of relatively cheap desktop computers made it possible to do things in entirely different and much more productive ways. In the mid-1990s the Internet burst on the scene and business was revolutionized again. Suddenly people bought PCs for home use so they could communicate via email and shop on line. Companies reorganized their processes to support web portals. That, in turn, suddenly increased competitive pressures as customers in one city could as easily buy items from a company in another city or country as from the store in their neighborhood. Amazon.com revolutionized the way books are bought and sold. Then came iPads, intelligent phones, intelligent cars, GPS, and the whole wireless revolution, with music, TV, and movies available on demand. Today an employee or a customer using some type of computer can access information or buy from your organization at any time from any location in the world.

The Internet and the Web and the broader trend toward globalization also made it easier for companies to coordinate their efforts with other companies. Increased competition and the search for greater productivity led companies to begin exploring all kinds of outsourcing. If another company could provide all the services your company's HR or IT departments used to provide, and was only an email away, it was worth considering. Suddenly, companies that had historically been manufacturers were outsourcing the manufacture of their products to China and were focusing instead on sticking close to their customers, so they could specialize in designing and selling new products that would be manufactured by overseas companies and delivered by companies who specialized in the worldwide delivery of packages.

In part, new technologies like the Internet and the Web are driving these changes. They make worldwide communication easier and less expensive than in the past. At the same time, however, the changes taking place are driving companies to jump on any new technology that seems to promise them an edge over their competition. Wireless laptops, cell phones, and personal digital assistants are being used by business people to work more efficiently. At the same time, the widespread purchase of iPods by teenagers is revolutionizing the music industry and driving a host of far-reaching changes and realignments.

We won't go on. Lots of authors and many popular business magazines write about these changes each month. Suffice it to say that change and competition have become relentless. Large companies are reorganizing to do business on a worldwide scale, and predictably some will do it better than others and expand, while those that are less successful will disappear. Meantime, smaller companies are using the Internet and the Web to explore the thousands of niche service markets that have been created.

Change and relentless competition call for constant innovation and for constant increases in productivity, and those in turn call for an even more intense focus on how work gets done. To focus on how the work gets done is to focus on business processes. Every manager knows that if his or her company is to succeed it will have to figure out how to do things better, faster, and cheaper than they are being done today, and that is what the focus on process is all about.

Notes and References

We provided a wide-ranging history of the evolution of business process techniques and concerns. We have included a few key books that provide a good overview to the concepts and techniques we described.

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Taylor, Frederick W., *The Principles of Scientific Management*, Harper's, 1911. For a modern review of the efficiency movement and Taylor check Daniel Nelson's *Frederick W. Taylor and the Rise of Scientific Management*, University of Wisconsin Press, 1980.

Bertalanffy, Ludwig von, *General Systems Theory: Foundations, Development, Applications*, George Braziller, 1968. An early book that describes how engineering principles developed to control systems ranging from thermostats to computers provided a better way to describe a wide variety of phenomena.

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Sterman, John D., *Business Dynamics: Systems Thinking and Modeling for a Complex World*, Irwin McGraw-Hill, 2000. Sterman is one of Forrester's students at MIT, and this is a popular textbook for those interested in the technical details of systems dynamics, as applied to business problems.

Senge, Peter M., *The Fifth Discipline: The Art and Practice of the Learning Organization*, Currency Doubleday, 1994. Senge is also at the Sloan School of Management at MIT, and a student of Forrester. Senge has created a more popular approach to systems dynamics that puts the emphasis on people and the use of models and feedback to facilitate organizational development. In the Introduction we described mature process organizations as organizations that totally involved people in constantly improving the process. Senge would describe such an organization as a learning organization.

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Hammer, Michael, "Reengineering Work: Don't Automate, Obliterate," *Harvard Business Review*, July–August 1990. This article, and the one below by Davenport and Short, kicked off the BPR fad. The books that these authors are best known for did not come until a couple of years later.

Rummler, Geary. 1984. Personal correspondence. Geary sent me a photocopy of a page from a course he gave in 1984 with a similar illustration.

Rummler, Geary, and Alan Brache, *Performance Improvement: Managing the White Space on the Organization Chart*, Jossey-Bass, 1990. Still the best introduction to business process redesign for senior managers. Managers read Hammer and Davenport in the early 1990s, and then turned to Rummler and Brache to learn how to actually do business process redesign. So many ideas that we now associate with business process change originated with Geary Rummler.

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Davenport, Thomas H., *Process Innovation: Reengineering Work through Information Technology*, Harvard Business School Press, 1993. This book doesn't have the breathless marketing pizzazz that Hammer's book has, but it's more thoughtful. Overall, however, both books advocate radical change to take advantage of the latest IT technologies.

Smith, Adam, *The Wealth of Nations* (any of several editions). Classic economics text that advocates, among other things, the use of work specialization to increase productivity.

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Davenport, Thomas H., *Mission Critical: Realizing the Promise of Enterprise Systems*, Harvard Business School Press, 2000. This is the book in which Davenport laid out the case for using ERP systems to improve company processes.

Ramias, Alan, *The Mists of Six Sigma*, October 2005, available at http://www.bptrends.com. Excellent history of the early development of Six Sigma at Motorola.

Scheer, August-Wilhelm, *Business Process Engineering: Reference Models for Industrial Enterprises* (2nd ed.), Springer, 1994. Scheer has written several books, all very technical, that describe how to use IT systems and modeling techniques to support business processes.

Harry, Mikel J., and Richard Schroeder, *Six Sigma: The Breakthrough Management Strategy Revolutionizing the World's Top Corporations*, Doubleday & Company, 1999. An introduction to Six Sigma by the Motorola engineer who is usually credited with originating the Six Sigma approach.

Harrington, H. James, Erik K. C. Esseling and Harm Van Nimwegen, *Business Process Improvement Workbook*, McGraw-Hill, 1997. A very practical introduction to process improvement, very much in the Six Sigma tradition, but without the statistics and with a dash of software diagrams.

Boar, Bernard H., *Practical Steps for Aligning Information Technology with Business Strategies: How to Achieve a Competitive Advantage*, Wiley, 1994. Lots of books have been written on business-IT alignment. This one is a little out of date, but still very good. Ignore the methodology, which gets too technical, but focus on the overviews of IT and how they support business change.

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Smith, Howard, and Peter Fingar, *Business Process Management, The Third Wave*, Meghan-Kiffer Press, 2003. Although this book is a bit over the top in some of its claims, like Hammer and Champy's *Reengineering the Corporation*, it got people excited about the idea of Business Process Management Software systems and helped kick off the current interest in BPM.

Womack, James P., Daniel T. Jones, and Daniel Roos, *The Machine that Changed the World: The Story of Lean Production*, Harper Collins, 1990. The book that launched the interest in Lean and the TPS in the United States.

PART

Organization-wide concerns

I

Until recently most business process efforts focused on redesigning or improving specific business processes. In the past decade, however, leading organizations have realized that they cannot achieve the results they want by modifying specific processes in isolation from one another. The only way to achieve significant competitive advantage is to assure that all the processes that make up a common value chain are integrated and support each other. Moreover, as organizations have become more international, they have become focused on assuring that they perform processes the same way in each country or region in which they operate. These insights have led organizations to begin to focus on organization-wide process concerns.

In essence, organizations have shifted from trying to improve specific processes to conceptualizing the entire organization as a system of interacting processes, and working to maximize the effectiveness of the whole system. Once executives shift from worrying about specific processes to worrying about all the processes in the organization, they naturally want a business model that shows how all the organization's processes fit together, a set of business-wide process measures that show how processes support business strategies, goals, and major business initiatives, and models that show all the processes and subprocesses are aligned to achieve the goals of the organization.

Anyone who becomes involved in the analysis of all the process activities at an organization needs an overview to keep track of all the different process concerns. We picture such an overview in Figure P1.1. In essence, we create a matrix that considers two separate types of concerns. On the vertical axis we ask whether the focus is on the organization as a whole, on a specific business process, or on providing resources or support services for one or more specific business processes. On the horizontal axis we consider whether the activity we are focused on is a project with a specific timeframe and goal, or if it is an ongoing activity of the organization. Thus the *sell insurance policies* process is an ongoing set of activities. Every day employees struggle to sell insurance policies. There is a sales manager who oversees the ongoing activities of those involved in sales. If the sales manager were to decide that the *sell insurance policies* process was broken and arranged for a team to redesign the sales process, there would be a period of time when the process team was working on the sales process redesign project at the same time the existing *sell insurance policies* process continued to work to sell policies. When the project team completed the redesign the new *sell insurance policies* process would be substituted for the current one, the project would end, and the team responsible for selling policies would continue to do so, following a new process.

In Figure P1.1 the vertical axis indicates the scope of the concern. At the top we show concerns that are organization wide. Below that we show concerns that are focused on specific business processes, and on the bottom row we show concerns that involve providing resources or support for one or more processes. The top level is divided into two different concerns. The very top is focused on defining organization strategy, goals, and business initiatives. This is almost always performed by the CEO or an executive committee. Usually, there is a project or a series of meetings to review and update strategy, goals, and initiatives. Then there are the executives who are assigned to track the achievement of the goals and initiatives on a day-to-day basis.

	Projects to achieve specific goals	Day-by-day execution
Level 1 Concern is organization-wide	Executive team defines strategy, goals and business initiatives	Executives monitor execution of business initiatives
	Business process architecture development projects	On-going, organization-wide management of process work
Level 2 Concern is with a specific business process	Business process design or redesign projects	Day-to-day execution of a specific business process
Level 3 Concern is with a resource that supports a process	Projects to develop support resources (e.g., software applications or training)	Day-to-day support of a specific business process

FIGURE P1.1

Types of process activities in organizations.

On the second row there are projects to define a business process architecture, including process models, measurements, and occasionally process management systems. Then, on an ongoing basis, there is usually some kind of group to maintain the business architecture and to support groups attempting to improve processes. Process practitioners are only rarely involved in the development of strategy and the selection of business initiatives, but they are almost always involved in the development of a business process architecture.

We'll consider other levels of Figure P1.1 when we turn to process and implementation concerns, but in this part we will focus on organization-wide concerns and what is involved in developing and supporting organization strategies, goals, initiatives, and all the various components of a good business process architecture.

Organizations that develop a good model of their business processes usually also want to define metrics to evaluate the success of their processes and to specify who will be responsible for managing each of the processes. This entire set of models and measures and the description of the resources aligned to support them is referred to as a *business process architecture*.

In the 1990s, when companies focused on improving specific processes, most process change was project oriented. One started with a broken process and worked until it was fixed. As companies shift to enterprise-level process work they find that they need to develop tools and organizational structures to support a sustained effort. A business process architecture isn't a product that can be developed in one push. A business process architecture is usually developed in stages over a period of time. It's usually easiest to begin with a description of an organization's processes and then later progress to defining measures and managerial responsibilities. The sophistication of the architecture tends to evolve as managers learn to use it as a tool for strategizing and decision making. Moreover, to be useful an architecture needs to be maintained and that requires an organization to constantly monitor processes and changes and incorporate them into the architecture. Thus, as companies begin to focus on organization-level process concerns, they find that they need to adopt an entirely new attitude and a new level of commitment to generate the desired results.

Restated in slightly different terms, any organization that shifts from focusing on specific processes to organization-wide concerns is making a major shift in its process maturity. It is undertaking a shift from CMM Level 2 to CMM Levels 3 and 4. Today it is common to refer to organizations whose executives decide to commit to organizing around processes as *process-centric* or *process-focused organizations*.

In this part we are going to focus on some of the key organization-wide concepts and practices that organizations need to understand and implement to become process-centric organizations.

In Chapter 2 we will discuss organization goals and strategies and business initiatives and how they can be tied to processes and to competitive advantage.

In Chapter 3 we will present an overview of a business process architecture methodology, one approach to defining and implementing the tools and practices needed to manage processes at the organization-wide level. We will also consider what's involved in understanding an enterprise and defining its major value chains and key business processes.

In Chapter 4 we will consider the idea of a business process architecture. A business architecture defines the major processes in a value chain, establishes their relationships, defines their performance measures, determines who manages each process, and describes how the processes are aligned to other organizational resources, including goals and policies, business rules, IT resources, training programs, and knowledge management systems.

We can't consider all aspects of a business process architecture in a single chapter, so we focus on modeling processes and resource alignment in Chapter 4, and then consider process measurement in Chapter 5 and management in Chapter 6.

In Chapter 7 we conclude our discussion of enterprise-level concerns by considering how a business process management (BPM) group—or BPM center of excellence—can be used to maintain the business process architecture, provide executives with timely reports, and support the ongoing process activities of an organization. We will also look at a case study in Chapter 7 to see how one organization has managed to implement all of the enterprise-level tools we have discussed in Part I.

CHAPTER

Strategy, value chains, business initiatives, and competitive advantage

2

In this chapter we want to discuss some of the ways that executives think about their organizations. It is important that process managers and practitioners understand this because, ultimately, they will be expected to develop business architectures and processes that support the strategies, goals, and initiatives developed by executives. As in so many areas of business, different theorists and different organizations use these terms in different ways. Here are our definitions, and we will try to use these terms consistently throughout the remainder of this book.

- *Goal*—A general statement of something executives want to gather data about, and a vector suggesting how they hope the data will trend. For example: *increase profits*.
- *Objective*—We can contrast a goal, like Increase Profits, with an objective, which might be: *increase profits by 3% by the end of this year*. Objectives are more specific than goals and not only include a unit of measure and a vector, but also include a specific measurable outcome and a timeframe.
- *Strategy*—A general statement of how we propose to achieve our goals. For example: *our strategy will be to offer the best products at a premium price*.
- *Business model*—A business model is another way to speak about how an organization will apply a strategy (usually providing more detail about how the strategy will change the organization or what implementation of the strategy will involve). For some a business model simply describes how a company will operate. For others a business model involves a spreadsheet that demonstrates how an organization will apply labor and technology to generate profits over the course of time.
- *Business initiatives*—A business initiative is a statement of an outcome executives want the organization to accomplish in the near future. For example: *all divisions will install enterprise resource planning (ERP) systems in the coming year*. Or, *each unit will reduce its expenses by 3% in the coming year*. Initiatives can sound very much like objectives, except that they tend to focus on what business units or people will do, rather than results that will be achieved.
- *Key performance indicators (KPIs)*—A KPI is a high-level measurement that organization executives intend to monitor to ensure that related goals, strategies, or initiatives are achieved. For example: *profits, completed ERP installations*.

Business Process Change. https://doi.org/10.1016/B978-0-12-815847-0.00002-9

- *Measures*—Just as goals can be contrasted with objectives that are more specific, KPIs can be contrasted with *measures*, which define not only what is to be measured, but also define the specific, desired outcome and the timeframe. Thus a measure might be *division profits for second quarter* or *departments that have completed ERP installations as of the end of the first quarter*.

We will discuss all these terms in more detail in other chapters, but these definitions should suffice for a discussion of the approaches executives employ in setting goals and strategies.

The concept of a business strategy has been around for decades, and the models and processes used to develop a company strategy are taught at every business school. A business strategy defines how a company will compete, what its goals will be, and what policies it will support to achieve those goals. Put a different way, a company's strategy describes how it will create value for its customers, its shareholders, and its other stakeholders. Developing and updating a company's business strategy is one of the key responsibilities of a company's executive officers.

We start our discussion of enterprise-level process concerns with a look at how business people talk about business strategy. This will establish a number of the terms we will need for our subsequent discussion of processes. To develop a business strategy, senior executives need to consider the strengths and weaknesses of their own company and its competitors. They also need to consider trends, threats, and opportunities within the industry in which they compete, as well as in the broader social, political, technological, and economic environments in which the company operates.

There are different schools of business strategy. Some advocate a formal process that approaches strategic analysis very systematically, while others support less formal processes. A few argue that the world is changing so fast that companies must depend on the instincts of their senior executives and evolve new positions on the fly in order to move rapidly.

The formal approach to business strategy analysis and development is often associated with the Harvard Business School. In this brief summary we begin by describing a formal approach that is derived from Harvard professor Michael E. Porter's book, *Competitive Strategy*. Published in 1980 and now in its 60th printing, *Competitive Strategy* has been the bestselling strategy textbook throughout the past two decades. Porter's approach is well known, and it will allow us to examine some models that are well established among those familiar with strategic management literature.

Defining a Strategy

Porter defines business strategy as "a broad formula for how a business is going to compete, what its goals should be, and what policies will be needed to carry out these goals." Figure 2.1 provides an overview of the three-phase process that Porter recommends for strategy formation.

- *Phase 1*: *Determine the current position of the company*. The formal strategy process begins with a definition of where the company is now—what its current

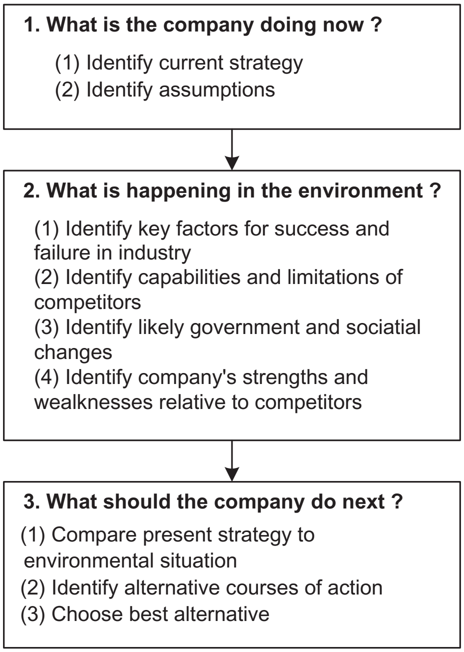

FIGURE 2.1

Porter's process for defining a company strategy.

Modified from Porter, Competitive Strategy.

strategy is—and the assumptions that the company managers commonly make about the company's current position, strengths and weaknesses, competitors, and industry trends. Most large companies have a formal strategy and have already gone through this exercise several times. Indeed, most large companies have a strategy committee that constantly monitors the company's strategy.

- *Phase 2*: *Determine what is happening in the environment*. In the second phase of Porter's strategy process (the middle box in Figure 2.1) the team developing the strategy considers what is happening in the environment. In effect, the team ignores the assumptions the company makes at the moment and gathers intelligence that will allow them to formulate a current statement of environmental constraints and opportunities facing all the companies in their industry. The team examines trends in the industry the company is in and reviews the capabilities and limitations of competitors. It also reviews likely changes in society and government policy that might affect the business. When the team has finished its current review, it reconsiders the company's strengths and weaknesses, relative to the current environmental conditions.
- *Phase 3*: *Determine a new strategy for the company*. During the third phase the strategy team compares the company's existing strategy with the latest analysis of what is happening in the environment. The team generates a number of scenarios or alternate courses of action that the company could pursue.

> In effect, the company imagines a number of situations the company could find itself in a few months or years hence and works backward to imagine what policies, technologies, and organizational changes would be required during the intermediate period to reach each situation. Finally, the company's strategy committee, working with the company's executive committee, selects one alternative and begins to make the changes necessary to implement the company's new strategy.

Porter offers many qualifications about the need for constant review and the necessity for change and flexibility, but overall Porter's model was designed for the relatively calmer business environment that existed 20 years ago. Given the constant pressures to change and innovate that we've all experienced during the last three decades, it may be hard to think of the 1980s as a calm period, but everything really is relative. When you contrast the way companies approached strategy development just 10 years ago with the kinds of changes occurring today, as companies scramble to adjust to the world of the Internet and the Cloud, the 1980s were relatively sedate. Perhaps the best way to illustrate this is to look at Porter's general model of competition.

Porter's Model of Competition

Porter emphasizes that "the essence of formulating competitive strategy is relating a company to its environment." One of the best-known diagrams in Porter's *Competitive Strategy* is the one we have illustrated in Figure 2.2. Porter's diagram, which pulls together lots of information about how executives conceptualize the competition when they formulate strategy, is popularly referred to as the "five forces model."

Porter identifies five changes in the competitive environment that can force a company to adjust its business strategy. The heart of business competition, of course, is the set of rival companies that comprise an industry. The company and its competitors are represented by the circle at the center of Figure 2.2.

- *Industry competitors*. As rival companies make moves the company must respond. Similarly, the company may opt to make changes itself to place its rivals at a disadvantage. Porter spends several chapters analyzing the ways companies compete within an industry, and we'll return to that in a moment. Beyond the rivalry between the companies that make up the industry, there are changes in the environment that can potentially affect all the companies in an industry. Porter classifies these changes into four groups: (1) buyers, (2) suppliers, (3) potential new companies that might enter the field, and (4) the threat that new products or services will become desirable substitutes for the company's existing products and services.
- *Buyers*. Buyers or customers will tend to want to acquire the company's products or services as inexpensively as possible. Some factors give the seller an advantage: if the product is scarce, if the company is the only source of the

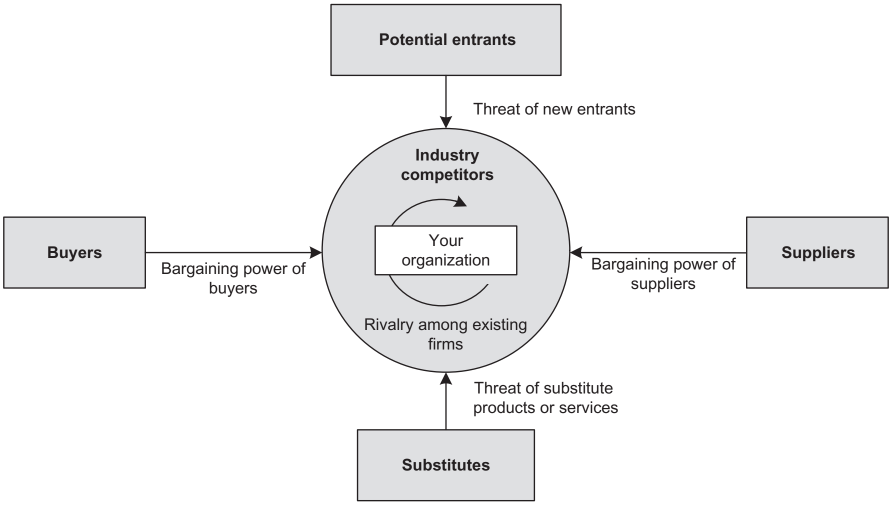

FIGURE 2.2

Porter's model of the five forces driving industry competition.

Modified from Porter, Competitive Strategy.

product or the only local source of the product, or if the company is already selling the product more cheaply than its competitors, the seller will tend to have better control of its prices. The inverse of factors like these gives the customer more bargaining power and tends to force the company to reduce its prices. If there are lots of suppliers competing with each other, or if it's easy for customers to shop around, prices will tend to fall.

- *Suppliers*. In a similar way, suppliers would always like to sell their products or services for a higher price. If the suppliers are the only source of a needed product, if they can deliver it more quickly than their rivals, or if there is lots of demand for a relatively scarce product, then suppliers will tend to have more bargaining power and will increase their prices. Conversely, if the supplier's product is widely available or available more cheaply from someone else, the company (buyer) will tend to have the upper hand and will try to force the supplier's price down.
- *Substitutes*. Companies in every industry also need to watch to see that no products or services become available that might function as substitutes for the products or services the company sells. At a minimum a substitute product can drive down the company's prices. In the worst case a new product can render the company's current products obsolete. The manufacturers of buggy whips were driven into bankruptcy when internal combustion automobiles replaced horse-drawn carriages in the early years of the 20th century. Similarly, the availability of plastic products has forced the manufacturers of metal, glass, paper, and wood products to reposition their products in various ways.

- *Potential entrants*. Finally, there is the threat that new companies will enter an industry and thereby increase the competition. More companies pursuing the same customers and trying to purchase the same raw materials tend to give both the suppliers and the customers more bargaining power, driving up the cost of goods and lowering each company's profit margins.

Historically, there are a number of factors that tend to function as barriers to the entry of new firms. If success in a given industry requires a large capital investment, then potential entrants will have to have a lot of money before they can consider trying to enter the industry. The capital investment could take different forms. In some cases a new entrant might need to build large factories and buy expensive machinery. The cost of setting up a new computer chip plant, for example, runs to billions of dollars, and only a very large company could consider entering the chip-manufacturing field. In other cases the existing companies in an industry may spend huge amounts on advertising and have well-known brand names. Any new company would be forced to spend at least as much on advertising to even get its product noticed. Similarly, access to established distribution channels, proprietary knowledge possessed by existing firms, or government policies can all serve as barriers to new companies that might otherwise consider entering an established industry.

Until recently the barriers to entry in most mature industries were so great that the leading firms in each industry had a secure hold on their positions and new entries were very rare. In the past three decades the growing move toward globalization has resulted in growing competition among firms that were formerly isolated by geography. Thus, prior to the 1960s the three large auto companies in the United States completely controlled the US auto market. Starting in the 1970s, and growing throughout the next two decades, foreign auto companies began to compete for US buyers and US auto companies began to compete for foreign auto buyers. By the mid-1980s a US consumer could choose between cars sold by over a dozen firms. The late 1990s witnessed a sharp contraction in the auto market, as the largest automakers began to acquire their rivals and reduced the number of independent auto companies in the market. Key to understanding this whole process, however, is to understand that these auto companies were more or less equivalent in size and had always been potential rivals, except that they were functioning in geographically isolated markets. As companies became more international, geography stopped functioning as a barrier to entry, and these companies found themselves competing with each other. They all had similar strategies, and the most successful have gradually reduced the competition by acquiring their less successful rivals. In other words, globalization created challenges, but it did not radically change the basic business strategies that were applied by the various firms engaged in international competition.

In effect, when a strategy team studies the environment, it surveys all of these factors. They check to see what competitors are doing, if potential new companies seem likely to enter the field, or if substitute products are likely to be offered. And they check on factors that might change the future bargaining power that buyers or sellers are likely to exert.

Industries, Products, and Value Propositions

Obviously Porter's model assumes that the companies in the circle in the middle of Figure 2.2 have a good idea of the scope of the industry they are in and the products and services that define the industry. Companies are sometimes surprised when they find that the nature of the industry has changed and that companies that were not formerly their competitors are suddenly taking away their customers. When this happens, it usually occurs because the managers at a company were thinking too narrowly or too concretely about what it is that their company was selling.

To avoid this trap, sophisticated managers need to think more abstractly about what products and services their industry provides. A "value proposition" refers to the value that a product or service provides to customers. Managers should always strive to be sure that they know what business (or industry) their company is really in. That's done by being sure they know what value their company is providing to its customers.

Thus, for example, a bookseller might think he or she is in the business of providing customers with books. In fact, however, the bookseller is probably in the business of providing customers with information or entertainment. Once this is recognized, then it becomes obvious that a bookseller's rivals are not only other book stores, but magazine stores, TV, and the Web. In other words, a company's rivals aren't simply the other companies that manufacture similar products, but all those who provide the same general value to customers. Clearly Rupert Murdoch realizes this. He has gradually evolved from being a newspaper publisher to managing a news and entertainment conglomerate that makes movies, owns TV channels and TV satellites, and sells books. His various companies are constantly expanding their interconnections to offer new types of value to their customers. Thus, Murdoch's TV companies and newspapers promote the books he publishes. Later, the books are made into movies that are shown on his TV channels and once again promoted by his newspapers.

As customers increasingly decide they like reading texts on automated book readers, like a Kindle or iPad, companies that think of themselves as booksellers are forced to reconsider their strategies. In this situation it will be obvious that the real value being provided is information and that the information could be downloaded from a computer just as well as printed in a book format. Many magazines are already producing online versions that allow customers to read articles on the Web or download articles in electronic form. Record and CD vendors are currently struggling with a version of this problem as copies of songs are exchanged over the Internet. In effect, one needs to understand that it's the song that has the value, and not the record or CD on which it's placed. The Web and a computer become a substitute for a CD if they can function as effective media for transmitting and playing the song to the customer.

Good strategists must always work to be sure they really understand what customer needs they are satisfying. Strategists must know what value they provide customers before they can truly understand what business they are really in and who their potential rivals are. A good strategy is focused on providing value to customers, not narrowly defined in terms of a specific product or service.

In some cases, of course, the same product may provide different value to different customers. The same car, for example, might simply be a way of getting around for one group of customers, but a status item for another set of customers.

In spite of the need to focus on providing value to customers, historically, in designing their strategies most companies begin with an analysis of their core competencies. In other words, they begin by focusing on the products or services they currently produce. They move from products to ways of specializing them and then to sales channels until they finally reach their various targeted groups of customers. Most e-business strategists suggest that companies approach their analysis in reverse. The new importance of the customer and the new ways that products can be configured for the Web suggest that companies should begin by considering what Web customers like and what they will buy over the Web, and then progress to what product the company might offer that would satisfy the new web customers. This approach, of course, results in an increasingly dynamic business environment.

Strategies for Competing

Earlier, we mentioned that Porter places a lot of emphasis on the ways existing companies can compete within an existing industry. In his 1980 book, *Competitive Strategy*, Porter described competition in most traditional industries as following one of three generic strategies: (1) cost leadership, (2) differentiation, or (3) niche specialization.

- *Cost leadership*. The cost leader is the company that can offer the product at the cheapest price. In most industries price can be driven down by economies of scale, by the control of suppliers and channels, and by experience that allows a company to do things more efficiently. In most industries large companies dominate the manufacture of products in huge volume and sell them more cheaply than their smaller rivals.
- *Differentiation*. If a company can't sell its products for the cheapest price an alternative is to offer better or more desirable products. Customers are often willing to pay a premium for a better product, and this allows companies specializing in producing a better product to compete with those selling a cheaper but less desirable product. Companies usually make better products by using more expensive materials, relying on superior craftsmanship, creating a unique design, or tailoring the design of the product in various ways.
- *Niche specialization*. Niche specialists focus on specific buyers, specific segments of the market, or buyers in particular geographical markets and often offer only a subset of the products typically sold in the industry. In effect, they represent an extreme version of differentiation, and they can charge a premium for their products, since the products have special features beneficial to the consumers in the niche.

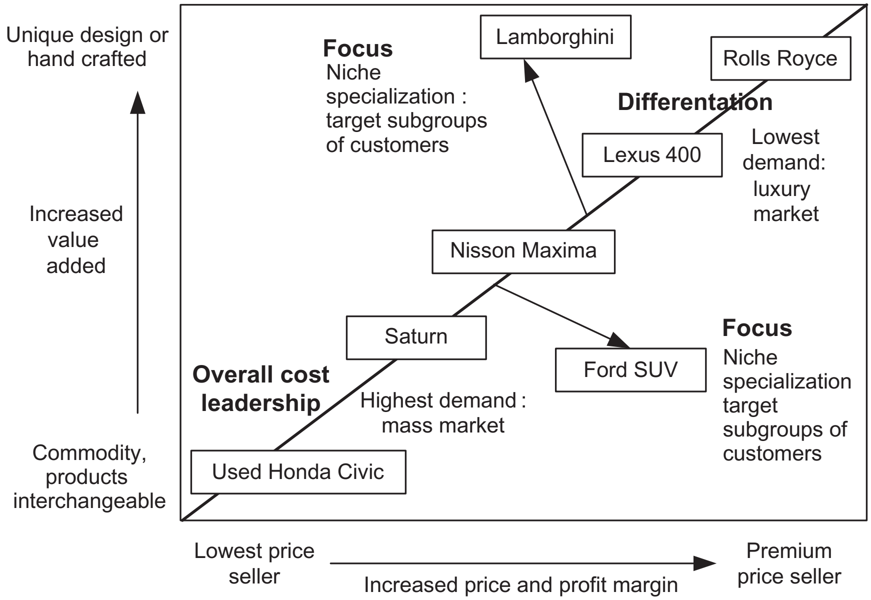

FIGURE 2.3

Some considerations in positioning a company or product.

Figure 2.3 provides an overview of one way strategists think of positioning and specialization. As a broad generalization, if the product is a commodity it will sell near its manufacturing cost, with little profit for the seller. Companies that want to sell commodities usually need to sell large volumes.

The classic example of a company that achieved cost leadership in an industry was the Ford Motor Company. The founder, Henry Ford, created a mass market for automobiles by driving the price of a car down to the point where the average person could afford one. To do this, Ford limited the product to one model in one color and set up a production line to produce large numbers of cars very efficiently. In the early years of the 20th century Ford completely dominated auto production in the United States.

As the US economy grew after World War I, however, General Motors was able to pull ahead of Ford, not by producing cars as cheaply, but by producing cars that were nearly as cheap and that offered a variety of features that differentiated them. Thus, GM offered several different models in a variety of colors with a variety of optional extras. Despite selling slightly more expensive cars, GM gradually gained market share from Ford because consumers were willing to pay more to get cars in preferred colors and styles.

Examples of niche specialists in the automobile industry are companies that manufacture only taxi cabs or limousines.

Porter's Theory of Competitive Advantage

Michael Porter's first book, *Competitive Strategy: Techniques for Analyzing Industries and Competitors*, is the one in which he analyzed the various sources of environmental threats and opportunities and described how companies could position themselves in the marketplace. Porter's second book, *Competitive Advantage: Creating and Sustaining Superior Performance*, was published in 1985. *Competitive Advantage* extended Porter's basic ideas on strategy in several important ways. For our purposes we will focus on his ideas about value chains, the sources of competitive advantage, and the role that business processes play in establishing and maintaining competitive advantage.

We've already encountered the idea of a value chain in the Introduction. Figure 2.2 illustrates Porter's generic value chain diagram.

Porter introduced the idea of the value chain to emphasize that companies ought to think of processes as complete entities that begin with new product development and customer orders and end with satisfied customers. To ignore processes or to think of processes as things that occur within departmental silos is simply a formula for creating a suboptimized company. Porter suggested that company managers should conceptualize large-scale processes, which he termed *value chains*, as entities that include every activity involved in adding value to a product or service sold by the company.

We've used the terms *value proposition* and *value chain* several times now, so we should probably offer a definition. The term *value*, as it is used in any of these phrases, refers to value that a customer perceives and is willing to pay for. The idea of the value chain is that each activity in the chain or sequence adds some value to the final product. It's assumed that if you asked the customer about each of the steps the customer would agree that the step added something to the value of the product. A value proposition describes in general terms a product or service that the customer is willing to pay for.

It's a little more complex, of course, because everyone agrees that there are some activities or steps that don't add value directly, but facilitate adding value. These are often called *value-enabling* activities. Thus, acquiring the parts that will later be used to assemble a product is a value-enabling activity. The key reason to focus on value, however, is ultimately to identify activities that are *nonvalue-adding* activities. These are activities that have been incorporated into a process, for one reason or another, that do not or no longer add any value to the final product. Nonvalue-adding activities should be eliminated. We'll discuss all this in later chapters when we focus on analyzing processes.

Figure 2.2 emphasizes that many individual subprocesses must be combined to create a complete value chain. In effect, every process, subprocess, or activity that contributes to the cost of producing a given line of products must be combined. Once all the costs are combined and subtracted from gross income from the sale of the products, one derives the profit margin associated with the product line. Porter discriminates between primary processes or activities, and includes inbound logistics, operations, outbound logistics, marketing and sales, and service. He also includes support processes or activities, including procurement, technology development, HR management, and firm infrastructure, which includes finance and senior management activities. Porter's use of the term *value chain* is similar to Hammer's use of *core process*. Many companies use the term *process* to refer to much more specific sets of activities. For example, one might refer to the Marketing and Sales process, the Order Fulfillment process, or even the Customer Relationship Management process. In this book, when we want to speak of comprehensive, large-scale processes we'll use the term *value chain*. In general, when we use the term *process* we will be referring to some more specific set of activities.

Although it doesn't stand out in Figure 2.2, if we represented each of the functions shown in the figure as boxes and connected them with arrows, we could see how a series of functions results in a product or service delivered to a customer. If we had such a representation we could also ask which functions added value to the process as it passed through that box. The term *value chain* was originally chosen to suggest that the chain was made up of a series of activities that added value to products the company sold. Some activities would take raw materials and turn them into an assembled mechanism that sold for considerably more than the raw materials cost. That additional value would indicate the value added by the manufacturing process. Later, when we consider activity costing in more detail we will see how we can analyze value chains to determine which processes add value and which do not. One goal of many process redesign efforts is to eliminate or minimize the number of nonvalue-adding activities in a given process.

Having defined a value chain Porter went on to define *competitive advantage* and show how value chains were key to maintaining competitive advantage. Porter offered these two key definitions:

- A *strategy* depends on defining a company position that the company can use to maintain a competitive advantage. A *position* simply describes the goals of the company and how it explains those goals to its customers.
- A *competitive advantage* occurs when your company can make more profits selling its product or service than its competitors can. Rational managers seek to establish a long-term competitive advantage. This provides the best possible return over an extended period for the effort involved in creating a process and bringing a product or service to market. A company with a competitive advantage is not necessarily the largest company in its industry, but it makes its customers happy by selling a desirable product, and it makes its shareholders happy by producing excellent profits.

Thus, a company anywhere in Figure 2.3 could enjoy a competitive advantage. Porter cites the example of a small bank that tailors its services to the very wealthy and offers extraordinary service. It will fly its representatives, for example, to a client's yacht anywhere in the world for a consultation. Compared with larger banks, this bank doesn't have huge assets, but it achieves the highest profit margins in the banking industry and is likely to continue to do so for many years. Its ability to satisfy its niche customers gives it a competitive advantage.

Two fundamental variables determine a company's profitability or the margin it can obtain from a given value chain. The first is the industry structure. That imposes broad constraints on what a company can offer and charge. The second is a competitive advantage that results from a strategy and a well-implemented value chain that lets a company outperform the average competitor in an industry over a sustained period of time.

A competitive advantage can be based on charging a premium because your product is more valuable, or it can result from selling your product or service for less than your competitors because your value chain is more efficient. The first approach relies on developing a good *strategic position*. The second advantage results from *operational effectiveness*.

As we use the terms a *strategy*, the *positioning* of a company, and *a strategic position* are synonyms. They all refer to how a company plans to function and present itself in a market.

In the 1990s many companies abandoned strategic positioning and focused almost entirely on operational effectiveness. Many companies speak of focusing on *best practices*. The assumption seems to be that a company can be successful if all of its practices are as good as or better than its competitors. The movement toward best practices has led to outsourcing and the use of comparison studies to determine the best practices for any given business process. Ultimately, Porter argues operational effectiveness can't be sustained. In effect, it puts all the companies within each particular industry on a treadmill. Companies end up practicing what Porter terms "hypercompetition," running faster and faster to improve their operations. Companies that have pursued this path have not only exhausted themselves, but they have watched their profit margins gradually shrink. When companies locked in hypercompetition have exhausted all other remedies they usually end up buying up their competitors to obtain some relief. That temporarily reduces the pressure to constantly improve operational efficiency, but it usually doesn't help improve the profit margins.

The alternative is to define a strategy or position that your company can occupy where it can produce a superior product for a given set of customers. The product may be superior for a wide number of reasons. It may satisfy the very specific needs of customers ignored by other companies, it may provide features that other companies don't provide, or it may be sold at a price other companies don't choose to match. It may provide customers in a specific geographical area with products that are tailored to that area.

Porter argues that, ultimately, competitive advantage is sustained by the processes and activities of the company. Companies engaged in hypercompetition seek to perform each activity better than their competitors. Companies competing on the basis of strategic positioning achieve their advantage by performing different activities or organizing their activities in a different manner.

Put a different way, hypercompetitive companies position themselves in the same manner as their rivals and seek to offer the same products or services for less money. To achieve that goal they observe their rivals and seek to ensure that each of their processes and activities is as efficient as or more efficient than those of their rivals. Each time a rival introduces a new and more efficient activity the company studies it and then proceeds to modify its equivalent activity to match or better the rival's innovation. In the course of this competition, since everyone introduces the same innovations, no one gains any sustainable advantage. At the same time margins keep getting reduced. This critique is especially telling when one considers the use of ERP applications, and we will consider this in detail later.

Companies relying on strategic positioning focus on defining a unique strategy. They may decide to focus only on wealthy customers and provide lots of service, or on customers that buy over the Internet. They may decide to offer the most robust product, or the least expensive product, with no frills. Once the company decides on its competitive position it translates that position into a set of goals and then lets those goals dictate the organization of its processes.

Porter remarks that a good position can often be defined by what the company decides not to do. It is only by focusing on a specific set of customers or products and services that one can establish a strong position. Once one decides to focus, management must constantly work to avoid the temptation to broaden that focus in an effort to acquire a few more customers.

If a company maintains a clear focus, however, then the company is in a position to tailor business processes and to refine how activities interact. Porter refers to the way in which processes and activities work together and reinforce one another as *fit*. He goes on to argue that a focus on fit makes it very hard for competitors to quickly match any efficiencies your company achieves. As fit is increased and processes are more and more tightly integrated, duplicating the efficiency of an activity demands that the competitor rearrange its whole process to duplicate not only the activity, but the whole process, and the relation of that process to related processes, and so on. Good fit is often a result of working to ensure that the handoffs between departments or functions are as efficient as possible.

In Porter's studies companies that create and sustain competitive advantage do it because they have the discipline to choose a strategic position and then remain focused on it. More important, they gradually refine their business processes and the fit of their activities so that their efficiencies are very hard for competitors to duplicate. It is process integration or fit that provides the basis for long-term competitive advantage and that provides better margins without the need for knee-jerk efforts to copy the best practices of rivals.

Porter's Strategic Themes

After writing *Competitive Advantage* in 1985, Porter shifted his focus to international competition. Then, in 1996 he returned to strategy concerns and wrote an article for the *Harvard Business Review* entitled "What Is Strategy?" which is still worth close study today. In addition to laying out his basic arguments against simple-minded operational efficiency and in favor of strategic positioning and the importance of integrated processes, Porter threw in the idea that strategists ought to create maps of activity systems to "show how a company's strategic position is contained in a set of tailored activities designed to deliver it."

Porter suggested that strategists create network diagrams that show how a limited set of high-level strategic themes, and the activities associated with those themes, fit together to support a strategic position.

Porter provided several examples, and we've chosen one to illustrate this idea. In the early 1990s the executives at Southwest Airlines decided on a strategy that emphasized their being the dependable, low-cost airline. Figure 2.4 illustrates the activity-system map Porter provided for Southwest Airlines. The themes are in the rectangles and a set of activities are shown in circles. To charge low prices Southwest limited service. They only operated from secondary airports and didn't assign seats or check baggage through to subsequent flights. They didn't serve meals and attendants cleaned the planes between flights. By limiting service they were able to avoid activities that took time at check-in and were able to achieve faster turnaround and more frequent departures. Thus Southwest averaged more flights with the same aircraft between set locations than their rivals. By standardizing on a single aircraft they were also able to minimize maintenance costs and reduce training costs for maintenance crews.

Porter argued that too many companies talked strategy, but didn't follow through on the implications of their strategy. They didn't make the hard choices required to actually implement a specific strategy, and hence they didn't create the highly integrated business processes that were very hard for rivals to duplicate. When companies do make the hard choices, as Southwest did, they find that the themes reinforce one another and the activities fit together to optimize the strategic position.

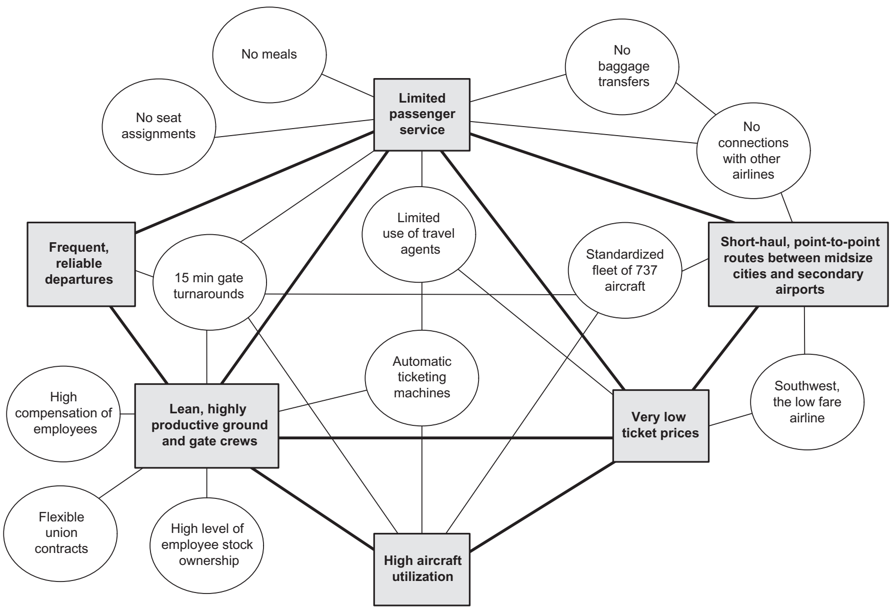

FIGURE 2.4

Strategic activity-system map for Southwest Airlines.

We've read lots of discussions of how business processes ought to support corporate strategies, and we certainly agree. Those who manage processes have an obligation to work to ensure that their process outcomes achieve corporate goals. Companies should work hard to align their process measures with corporate performance measures and to eliminate subprocesses that are counter to corporate goals. Different theorists have proposed different ways of aligning process activities and outcomes to goals. Most, however, assume that when executives announce goals, process people will simply create processes that will implement those goals.

Porter suggests something subtler. He suggests that smart senior executives think in terms of processes. In effect, one strategic goal of the organization should be to create value chains and processes that are unique and that fit together to give the organization a clear competitive advantage that is difficult for rivals to duplicate. He doesn't suggest that senior executives should get into the design or redesign of specific business processes, but he does suggest that they think of the themes that will be required to implement their strategies, which are ultimately defined by products and customers, and think about the hard choices that will need to be made to ensure that the themes and key processes will fit together and be mutually reinforcing.

This isn't an approach that many companies have taken. However, a process manager can use this concept to in effect "reverse-engineer" a company's strategy. What are your value chains? What products do your value chains deliver to what customers? What is your positioning? What value propositions does your organization present to your customers when you advertise your products? Now develop an ideal activity-system map to define your company's strategic positioning. Then compare it with your actual themes and activities. Do your major themes reinforce each other, or do they conflict? Think of a set of well-known activities that characterize one of your major processes. Do they support the themes that support your company's strategic positioning?

This exercise has led more than one process manager to an "Ah ha! moment" and provided insight into why certain activities always seem to be in conflict with each other.

As Porter argues, creating a strategy is hard work. It requires thought and then it requires the discipline to follow through with the implications of a given strategic position. If it is done correctly, however, it creates business processes that are unique and well integrated and that lead to successes that are difficult for rivals to duplicate.

The alternative is for everyone to try to use the same best practices, keep copying each other's innovations, and keep lowering profit margins till everyone faces bankruptcy. Given the alternative, senior management really ought to think about how strategy and process can work together to generate competitive advantage.

Treacy and Wiersema's Positioning Strategies

Two other strategy theorists, Michael Treacy and Fred Wiersema, generated a lot of discussion in the mid-1990s with their book, *The Discipline of Market Leaders*, which extended Porter's ideas on generic strategies by focusing on customers and company cultures. Treacy and Wiersema suggest that there are three generic types of customers: (1) those whose primary value is high-performance products or services, (2) those whose primary value is personalized service, and (3) those who most value the lowest priced product. It's easy to see how these might be mapped to Porter's generic strategies, but they capture subtle differences. Like Porter, Treacy and Wiersema argue in favor of strategic differentiation and assert that "no company can succeed today by trying to be all things to all people. It must instead find the unique value that it alone can deliver to a chosen market." The authors argue that companies can study their customers to determine what value proposition is most important to them. If they find that their customers are a mix of the three types the company needs to have the discipline to decide which group they most want to serve and focus their efforts accordingly. According to Treacy and Wiersema the three value positions that companies must choose between are:

- *Product leadership*. These companies focus on innovation and performance leadership. They strive to turn new technologies into breakthrough products and focus on product life cycle management.
- *Customer intimacy*. These companies focus on specialized, personal service. They strive to become partners with their customers. They focus on customer relationship management.
- *Operational excellence*. These companies focus on having efficient operations to deliver the lowest priced product or service to their customers. They focus on their supply chain and distribution systems to reduce the costs of their products or services.

Just as one can conceive of three types of customers one can also imagine three types of company cultures. A company culture dominated by technologists is likely to focus on innovation and on product leadership. A company culture dominated by marketing or salespeople is more likely to focus on customer intimacy. A company culture dominated by financial people or by engineers is likely to focus on cutting costs and operational excellence.

Using this approach we can represent a market as a triangle, with the three value positions as three poles. Then we can draw circles to suggest the emphasis at any given organization. It is common to begin a discussion with executives and hear that they believe that their organization emphasizes all three of these positions equally. Invariably, however, as the discussion continues and you consider what performance measures the executives favor and review why decisions were taken, one of these positions emerges as the firm's dominant orientation. In Figure 2.5 we show the basic triangle and then overlay a circle to suggest how we would represent a company that was primarily focused on customer intimacy and secondarily focused on product leadership.

Obviously, an MBA student learns a lot more about strategy. For our purposes, however, this brief overview should be sufficient. In essence, business managers are taught to evaluate a number of factors and arrive at a strategy that will be compatible with the company's strengths and weaknesses and that will result in a reasonable

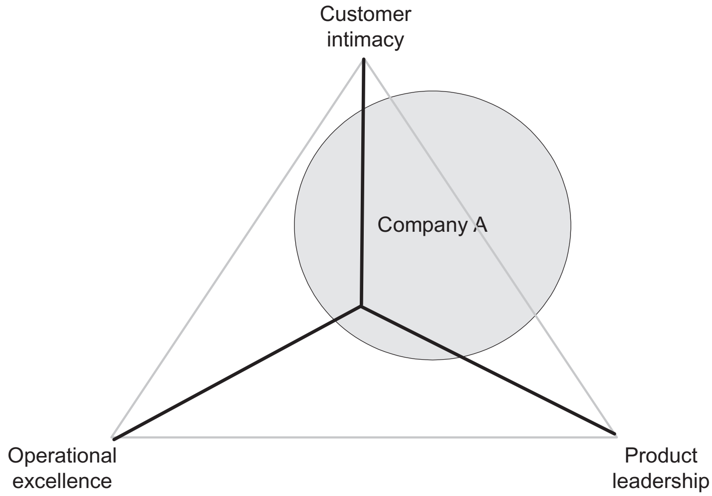

FIGURE 2.5

Treacy and Wiersema's three positioning strategies.

profit. Historically, companies have developed a strategy and, once they succeeded, continued to rely on that strategy with only minor refinements for several years (refer to *value nets* in the Notes and References section).

The Balanced Scorecard Approach to Strategy

Robert S. Kaplan and David P. Norton are consultants who are closely related to the Harvard approach to strategy. Their influence began when they wrote an article titled "The Balanced Scorecard—Measures That Drive Performance," which appeared in the January–February 1992 issue of the *Harvard Business Review* (HBR). Since then Kaplan and Norton have produced several other articles, a series of books, and a consulting company, all committed to elaborating the themes laid down in the initial "Balanced Scorecard" article.

Kaplan and Norton published *Strategy Maps*, their third book, in 2004. In the Introduction they explained that their journey began in 1990 when they undertook a research project to explore ways that organizations measured performance. At the time they believed that knowledge-based assets—primarily employees and IT—were becoming increasingly important for companies' competitive success, but that, despite that, most companies were still focused on measuring short-term financial performance. They also believed that "financial reporting systems provided no foundation for measuring and managing the value created by enhancing the capabilities of an organization's intangible assets." They argued that organizations tended to get what they measured. The result of this research effort was the Balanced Scorecard approach.

In essence, the Balanced Scorecard approach insists that management track four different types of measures: *financial* measures, *customer* measures, *internal business* (process) measures, and *innovation and learning* measures. Using the Balanced Scorecard approach an organization identifies corporate objectives within each of the four categories, and then aligns the management hierarchy by assigning each manager his or her own scorecard with more specific objectives in each of the four categories. Properly used the system focuses every manager on a balanced set of performance measures.

As soon as they published their now classic HBR article on the Balanced Scorecard methodology, Kaplan and Norton found that "while executives appreciated a more comprehensive new performance measurement system, they wanted to use their new system in a more powerful application than they had originally envisioned. The executives wanted to apply the system to solve the more important problem they faced—how to implement new strategies."

In a series of articles and books, Kaplan and Norton have gradually refined a methodology that seeks to align a balanced set of measures to an organization's strategy. They use a top-down method that emphasizes starting with the executive team and defining the organization's strategic goals, and then passing those goals downward, using the Balanced Scorecard. They argue that success results from a strategy-focused organization, which, in turn, results from strategy maps and Balanced Scorecards.

Figure 2.6 provides an overview of a strategy map. Kaplan and Norton claim that this generic map reflects a generalization of their work with a large number of companies for whom they have developed specific strategy maps. Notice that the four sets of Balanced Scorecard measures are now arranged in a hierarchical fashion, with financial measures at the top, driven by customer measures, which are in turn the result of internal (process) measures, which in turn are supported by innovation and learning measures.

Their approach to strategy is explained in their September–October 2000 HBR article, "Having Trouble with Your Strategy? Then Map It." The main thing the new book adds is hundreds of pages of examples, drawn from a wide variety of different organizations. For those that need examples this book is valuable, but for those who want theory the HBR article is a lot faster read.

Given our focus on process we looked rather carefully at the *themes*, which are, in essence, described as the internal perspective on the strategy map. Kaplan and Norton identify four themes that they go on to describe as "value-creating processes." Scanning across the strategy map in Figure 2.6 the themes are *operations management processes* (supply chain management), *customer management processes* (customer relationship management), *innovation processes* (the design and development of new products and services), and *regulatory and social processes*. The latter is obviously a support process and doesn't go with the other three, but would be better placed in their bottom area where they treat other support processes like HR and IT. Obviously, identifying these large-scale business processes is very much in the spirit of the times. Software vendors have organized around supply chain management

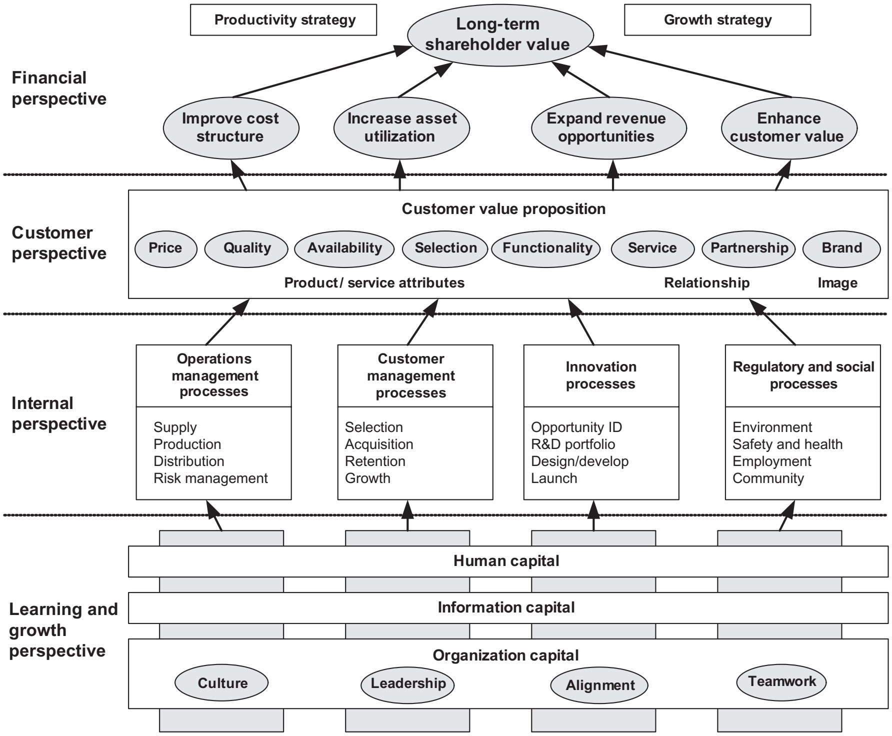

FIGURE 2.6

Balanced Scorecard approach to strategy.

Modified from Kaplan and Norton.

and customer relationship management, and the Supply Chain Council is seeking to extend the SCOR model by adding a Design Chain model and a Customer Chain model.

The problem with any of these efforts is that, if they aren't careful, they get lost in business processes, and lose the value chain that these business processes enable. Going further, what is missing in *Strategy Maps* is any sense of a value chain. One strategy map actually places an arrow behind the four themes or sets of processes in the internal perspective to suggest they somehow fit together to generate a product or service, but the idea isn't developed. One could read *Strategy Maps* and come away with the idea that every company had a single strategy. No one seems to consider organizations with four different business units producing four different product lines. Perhaps we are to assume that strategy maps are only developed for lines of business and that everything shown in the internal perspective always refers to a single value chain. If that's the case, it is not made explicit in *Strategy Maps*.

The fact that the process is on one level and the customer is on another is a further source of confusion. When one thinks of a value chain, there is a close relationship between the value chain, the product or service produced, and the customer. To isolate these into different levels may be convenient for those oriented to functional or departmental organizations, but it is a major source of confusion for those who are focused on processes.

Overall, the strategic perspective that Kaplan and Norton have developed is a step forward. Before Kaplan and Norton, most academic strategy courses were dominated by the thinking of Michael Porter, who began by emphasizing the "Five Forces Model" that suggested what external, environmental factors would change an organization's competitive situation, and then focused on improving the value chain. By contrast, Kaplan and Norton have put a lot more emphasis on measures and alignment, which has certainly led to a more comprehensive approach to strategy. But their approach stops short of defining a truly process-oriented perspective.

We have described the 1990s as primarily concerned with horizontal alignment. Companies tried to eliminate operational and managerial problems that arose from silo thinking and see how a value chain linked all activities, from the supplier to the customer. Today, most companies seem to have moved on to vertical alignment and are trying to structure the way strategies align with measures and how processes align to the resources that implement them. In the shift we believe that something very valuable from the horizontal perspective has been lost. Kaplan and Norton put too much emphasis on vertical alignment and risk losing the insights that derive from focusing on value chains and horizontal alignment.

We're sure that this is not the intent of Kaplan and Norton, and that they would argue that their process layer was designed to ensure that horizontal alignment was maintained. To us, however, the fact that they don't mention value chains, and define their internal perspective themes in such an unsophisticated way, from the perspective of someone who is used to working on business process architectures, indicates that they have in fact failed to incorporate a sophisticated understanding of process in their methodology. We suspect that the problem is that they start at the top and ask senior executives to identify strategic objectives and then define measures associated with them. In our opinion this isn't something that can be done in isolation. Value chains have their own logic, and the very act of defining a major process generates measures that must be incorporated into any measurement system.

Many large US companies have embraced some version of the Balanced Scorecard system, and have implemented one or another version of the methodology. Fewer, we suspect, have embraced strategy maps, but the number will probably grow since the maps are associated with the Scorecard system that is so popular. We think overall that this is a good thing. Most organizations need better tools to use in aligning strategies and managerial measures, and the Balanced Scorecard methodology forces people to think more clearly about the process and has in many cases resulted in much better managerial measurement systems.

For those engaged in developing business strategies, or developing corporate performance systems, the Kaplan and Norton HBR article is critical reading (refer to *value nets* notes in Notes and References section). Those who want to create process-centric organizations, however, will need to extend the Kaplan and Norton approach.

Business Models

In the past decade it has become popular to speak of strategic issues as *business model* issues. This terminology reflects an approach that entrepreneurs are more likely to use. In essence, a business model describes how a company plans to make money. Many business models are accompanied by statements that suggest how the company will position itself and use technology to generate a new product or service more efficiently or effectively than its competitors. Several management authors have written books describing the use of business models as a way of deriving a strategy and goals. Some are interesting and we cite the most popular in our references. Suffice to say, however, that business models are really just a spin on positioning and strategy, as described by Porter and others. If your company prefers to speak of business models, fine. The key from the perspective of the process practitioners is simply to ensure that you understand what your executives seek to achieve.

Business Initiatives

Finally, we come to business initiatives. Executives could conceivably define a strategy and announce goals and leave it at that, content to let middle managers organize their efforts accordingly. In most cases, however, the executive team will begin with strategies and goals, and then define a few high-priority initiatives. In essence, the executive team moves from wanting to improve the organization's profit by 3% a year to mandating that each division will increase its specific profit by some given amount. Or, they will move from wanting to make customers happier to mandating that the sales process be redesigned in the course of the coming year. In most cases business initiatives are associated with KPIs, which are carefully monitored. In some cases managers' bonuses depend on achieving the KPIs associated with key initiatives.

In the worst case the CEO launches a business initiative and division managers are so concerned with achieving the goals of the initiative that they ignore other operational concerns. An initiative to install ERP may, for example, be allowed to so disrupt regular business processes that sales decline as customers become frustrated with the resulting confusion. In the best case, on the other hand, business initiatives provide guidance to those doing process work and provide them with clear directions as to how to modify major business processes to keep them aligned with the strategic direction the organization is taking.

Summary

We urge readers to study Porter's *Competitive Advantage*. In helping companies improve their business processes we have often encountered clients who worried about revising entire processes and suggested instead that standard ERP modules be employed.

Some clients worried that we were advocating hypercompetition and urging them to begin revisions that their competitors would match, which would then require still another response on their part. It seemed to them it would be easier just to acquire standard modules that were already "best of breed" solutions. Undoubtedly this resulted from our failure to explain our position with sufficient clarity.

We do not advocate making processes efficient for their own sake, nor do we advocate that companies adopt a strategy based strictly on competitive efficiency. Instead, we advocate that companies take strategy seriously and define a unique position that they can occupy and in which they can prosper. We urge companies to analyze and design tightly integrated processes. Creating processes with superior fit is the goal. We try to help managers avoid arbitrarily maximizing the efficiency of specific activities at the expense of the process as a whole.

We certainly believe that companies should constantly scan for threats and opportunities. Moreover, we recommend that companies constantly adjust their strategies when they see opportunities or threats to their existing position. It's important, however, that the position be well defined, and that adjustments be made to improve a well-defined position and not simply for their own sake. In the past few years we've watched dozens of companies adopt Internet technologies without a clear idea of how those technologies were going to enhance their corporate position. In effect, these companies threw themselves into an orgy of competitive efficiency, without a clear idea of how it would improve their profitability. We are usually strong advocates of the use of new technology, and especially new software technologies. *Over* the last few decades IT has been the major source of new products and services, a source of significant increases in productivity, and the most useful approach to improving process fit. We advocate the adoption of new technology, however, only when it contributes to an improvement in a clearly understood corporate position.

We also recommend that companies organize so that any changes in their strategic position or goals can be rapidly driven down through the levels of the organization and result in changes in business processes and activities. Changes in goals without follow-through are worthless. At the same time, as companies get better and better at rapidly driving changes down into processes, subprocesses, and activities, it's important to minimize the disruptive effect of this activity. It's important to focus on the changes that really need to be made and to avoid undertaking process redesign, automation, or improvement projects just to generate changes in the name of efficiency or a new technology that is unrelated to high-priority corporate goals.

To sum up: We don't recommend that companies constantly change their strategic position to match a competitor's latest initiatives. We don't advocate creating a system that will simply increase hypercompetition. Instead, we believe that companies should seek positions that can lead to a long-term competitive advantage and that can only be accomplished as the result of a carefully conceived and focused corporate strategy. We argue for a system that can constantly tune and refine the fit of processes that are designed and integrated to achieve a well-defined, unique corporate position.

There will always be processes and activities that will be very similar from one company to another within a given industry. Similarly, within a large process there will always be subprocesses or activities that are similar from one company to another. In such cases we support a best-practices approach, using ERP modules or by outsourcing. Outsourcing, done with care, can help focus company managers on those core processes that your company actually relies on and eliminate the distraction of processes that add no value to your core business processes.

At the same time we are living in a time of rapid technological change. Companies that want to avoid obsolescence need to constantly evaluate new technologies to determine if they can be used to improve their product or service offerings. Thus, we accept that even well-focused companies that avoid hypercompetition will still find themselves faced with a steady need for adjustments in strategy and goals and for process improvement.

Ultimately, however, in this book we want to help managers think about how they can create unique core processes, change them in a systematic manner, and integrate them so that they can serve as the foundation for long-term competitive advantage.

Notes and References

Some strategists have recently argued that value chains are too rigid to model the changes that some companies must accommodate. They suggest an alternative that is sometimes termed *value nets*. IBM represents this approach with business component models (BCMs). (Recently some have begun to speak of this approach as a Capability Model.) This approach treats business processes as independent entities that can be combined in different ways to solve evolving challenges. Thus, the value nets approach abandons the idea of strategic integration, as Porter defines it, to achieve greater flexibility. The value nets and BCM models we have seen simply represent business processes, and don't show how those processes are combined to generate products for customers. We suspect that this new approach will prove useful, but only if it can be combined with the value chain approach so that companies can see how they combine their business processes (or components) to achieve specific outcomes. Otherwise, the value nets approach will tend to suboptimize potential value chain integration and tend to reduce things to a set of best practices, with all the accompanying problems that Porter describes when he discusses operational effectiveness.

The best book that describes the value nets approach is David Bovet and Joseph Martha's *Value Nets* (Wiley, 2000). The best paper on IBM's variation on this approach is *Component Business Models: Making Specialization Real* by George Pohle, Peter Korsten, and Shanker Ramamurthy published by IBM Institute for Business Value (IBM Business Consulting Services). The paper is available on the IBM Developer website.

Porter, Michael E., *Competitive Strategy: Techniques for Analyzing Industries and Competitors*, The Free Press, 1980. The bestselling book on strategy throughout the past two decades. The must-read book for anyone interested in business strategy.

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Porter, Michael E., "What Is Strategy?," *Harvard Business Review*, November–December 1996, Reprint No. 96608. This is a great summary of Porter's *Competitive Advantage*. It's available at http://www.amazon.com.

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Treacy, Michael, and Fred Wiersema, *The Discipline of Market Leaders: Choose Your Customers, Narrow Your Focus, and Dominate Your Market*, Addison-Wesley, 1995. This book was extremely popular in the late 1990s and is still worthwhile. It provides some key insights into company cultures and how they affect positioning and the customers you should target.

Kaplan, Robert S., and David P. Norton, "Having Trouble with Your Strategy? Then Map It," *Harvard Business Review*, September–October 2000. This article is available at http://www.amazon.com.

Kaplan, Robert S., and David P. Norton, *Strategy Maps: Converting Intangible Assets into Tangible Outcomes*, Harvard Business School Press, 2004. The Kaplan-Norton model often confuses the relationship between processes and measures, but it also provides lots of good insights. Read it for insights, but don't take their specific approach too seriously, or your process focus will tend to get lost. Kaplan and Norton's previous book on the Balanced Scorecard approach to strategy was *The Strategy Focused Organization*, which was published by Harvard Business School Press in 2001, and it's also worth a read.

Osterwalder, Alexander, and Yves Pigneur, *Business Model Generation*, Wiley, 2010. This is a currently popular book on how one can use a business model to define your company's position and goals.

CHAPTER

Understanding your organization

3

In this chapter we will develop an overview of the various types of business process concerns companies deal with at the enterprise level. Companies approach enterprise-level activities in many different ways. Some, for example, use the Balanced Scorecard approach to help with the alignment of corporate goals and the evaluation of managers, but do not tie that program to business processes in any rigorous way. Others have a business process architecture, but do not tie their architectural models to their ongoing business performance evaluations. For historical reasons, companies have begun the enterprise-level journey from many different starting points.

A Comprehensive Business Process Method

To organize our discussion of enterprise-level concerns we will begin by considering the method taught by BPTrends. This is not the only possible approach, but it is one possible approach, and it provides a good starting point for our discussion of how we might systematically address concerns at the enterprise level. Figure 3.1 provides an overview of BPTrends' process change methodology. In this figure we actually picture two complementary methods: one for business architecture development and one for business process redesign projects. The transformation planning shown at the top of the figure is not part of the BPTrends method, but rather a set of activities that senior executives undertake. Similarly, the actual development of training, facilities, or software systems that takes place at the bottom of the figure is undertaken by more specialized groups using their own methods. The BPTrends method focuses on structuring two different sets of activities: those involved in creating a business process architecture and those involved in undertaking a specific business process redesign project. The business process architecture method is concerned with creating the tools that a company can use to organize and manage all its process work. This method does not so much define a project as an ongoing effort on the part of management to create and maintain the tools they need to function as a process-centric organization. The process-level method is similar to many other process improvement methods and is designed to be used over and over again. The two methods are connected, in practice, because it is the tools created by the business architecture effort that enable an organization to define, prioritize, and manage all its ongoing business process change efforts. In Part I of this book we will focus on the concerns defined by the business process architecture method. In Part II we will consider specific business process change methods.

Business Process Change. https://doi.org/10.1016/B978-0-12-815847-0.00003-0

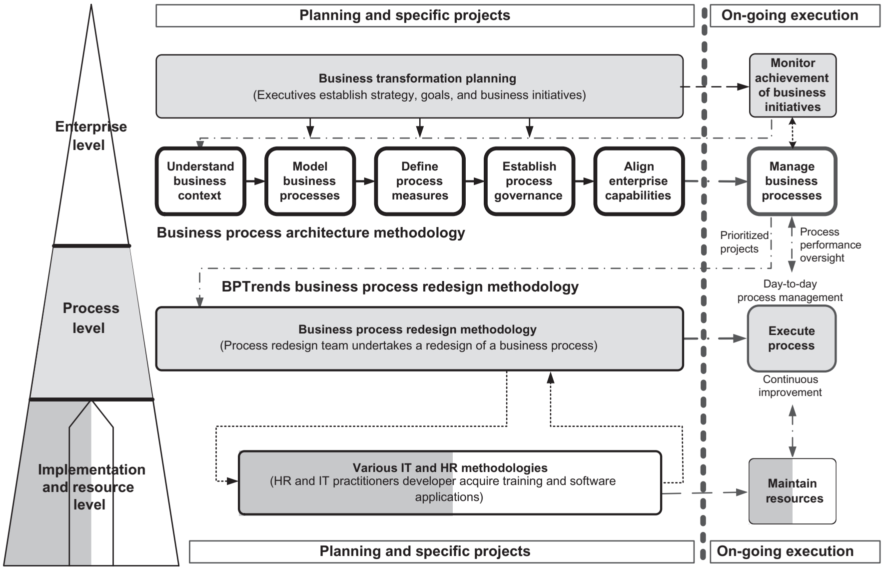

FIGURE 3.1

BPTrends' process change methodology.

We show transformation planning in a box above the phases in the business process architecture effort. This is to remind us that those working on a process architecture must be constantly interacting with the strategies, goals, and business initiatives defined by the organization's senior executives.

Understanding your business. The first phase in BPTrends' business process architecture method focuses on understanding the organization as a whole. This phase often involves the executive committee and the senior executives of the company. It is absolutely critical that everyone understands and agrees on the basic value chain processes the company supports and the strategic goals each value chain is responsible for achieving.

The *understand business context* phase begins with an analysis of the organization to define the organization's strategy, goals, and key relationships and gradually refine everyone's understanding of the organization and its stakeholders, including stockholders, customers, suppliers, distributors, and various governmental entities. During this phase the value chains of the organization are defined. The goals of each value chain and the relationship between core processes and managerial and support processes are also specified. Thus a specific business process architecture is developed for each individual value chain. As a result of this phase everyone agrees on the basic value chains and the organization is in a position to proceed to define architectures for each value chain.

Defining a business process architecture. The second phase begins with the selection of a specific value chain and the commitment to create a business process architecture for that value chain. At a minimum each value chain is defined by elucidating the core business processes and subprocesses in the value chain. Then, using the business processes defined in the architecture the team proceeds to define how each process will be monitored and measured. Depending on the needs of the organization, resources can then be aligned to the processes in the process architecture. Some companies will want to align policies and business rules with their processes. Some will want to align IT resources, like software applications and databases. Others will want to align HR, including jobs, skill requirements, training programs, and knowledge management programs.

There are different approaches to the creation of a business process architecture. Historically, the most popular way to define a company's processes has been to put a group of managers in a room and discuss how things get done. Usually, following much discussion the group arrives at a high-level overview of the company's major processes. Today, that activity, and the associated activity of defining process measures, can be considerably accelerated by using a business process framework. The BPTrends enterprise method usually relies on using the extended version of a business process framework to help managers develop a basic business process architecture and measurement system with a minimum fuss.

Define process governance. Once the business process architecture is in place and measures are defined for each of the major processes the team should move on to the development of a plan to manage their organization's business processes. Different organizations take various approaches. Some rely primarily on a functional (departmental) organization. A few rely on a process-oriented management organization. Most end up with some kind of matrix that includes both functional and process managers. We will consider the options in Chapter 5. At the same time the enterprise process team will want to consider how to measure and monitor the performance of process managers. Many companies rely on a Balanced Scorecard–oriented approach, either using a portion of each manager's scorecard to track his or her performance as a process manager or creating a dual scorecard system with one set of scorecards monitoring process work and another monitoring functional responsibilities.

During this same phase the team will probably also create a business process management (BPM) group (or BPM center of excellence) to provide the staff to help senior executives monitor processes, maintain the architecture tools, and undertake ongoing responsibilities, such as prioritizing project change projects.

Keep in mind that these phases will need to be adjusted to the individual organization. One organization, for example, might already have an existing BPM center of excellence. In this case it would probably be the BPM center of excellence that creates the architecture. In other cases an ad hoc group will be established to create the architecture and then to create the BPM group to maintain it. When attempting to change the way things are organized at the enterprise level, one always starts with what is already in place and moves forward from there.

Day-to-day management of enterprise processes. An enterprise methodology focuses on helping an organization develop the basic tools needed to create and manage a process-centric organization. Once the basic tools are in place and a BPM group is established the ongoing maintenance and use of the tools becomes a matter of execution. We will discuss what the day-to-day governance of a process-centric organization entails and provide a case study to show how a process-centric organization functions.

Strategy and Enterprise BPM

Everything should begin with a corporate strategy. In most cases the corporate strategy has already been developed by an executive committee or a group whose major responsibility is the creation and review of strategy. Thus, in most cases the business process team that is charged with developing enterprise-level process tools for the company will simply establish a working relationship with the strategy group. In fact, in most large companies strategy work occurs on many levels. There is an enterprise strategy, strategies for specific value chains, and in many cases strategies for major business processes. It is not uncommon to speak of a supply chain strategy or a marketing strategy. Thus, even if a corporate group creates the company strategy, the business process group may be heavily involved in ensuring that the corporate strategy is reflected in the specific strategies of the individual business processes.

Figure 3.2 illustrates one way of thinking about the relationship between the work of a process group and a strategy group. The ongoing work of the strategy group is described in the upper box. The executive team may spend a good bit of their time considering what the competition is doing or how customer tastes are changing; however, ultimately, to determine if the current strategy is working they need some kind of performance measures. Specifically, they need to know which activities are generating what type of results. If there was no process group the strategy group

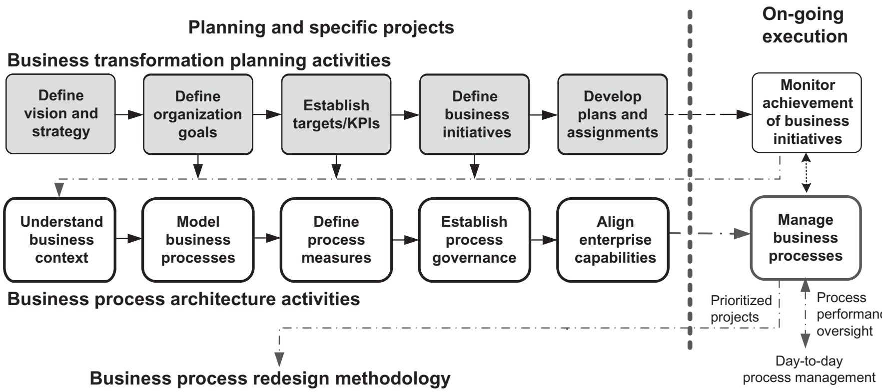

FIGURE 3.2

Enterprise process managers and those in strategy need a common set of tools.

would need to generate some kind of map of the organization and determine how to associate metrics and performance outcomes with the entities on their map. Put a different way, the strategy group needs some tools and they need a constant flow of data.

Managers and the BPM group need information about how the organization is divided into value chains, processes, and subprocesses and how specific processes are measured and managed, and they also need to keep track of changes in performance. In essence, an enterprise process method is just a systematic plan for generating the tools that managers, the strategy group, and the BPM group need to do their work. The creation of a BPM group is simply an efficient way of ensuring that the needed tools are maintained and the needed data are gathered and distributed to those who need them in a timely manner.

In the past most organizations have undertaken strategy efforts without the availability of good process tools. Since the 1980s, relying on Michael Porter's work on value chains, there has been a significant shift. Strategy no longer depends on data drawn primarily from functional units. Today, strategy depends on processes, how processes interact with each other, how process performance is measured, and a deep understanding of how processes interface with customers. Thus, with or without a formal enterprise process, organizations are engaged in defining enterprise-level tools that will provide the structure and the data needed to make important day-to-day decisions and to support key initiatives, like the entry into new markets, mergers, acquisitions, or outsourcing. As we have already suggested, a business process enterprise method simply provides a systematic way to achieve that goal.

Understand the Enterprise

An enterprise methodology begins with a phase that focuses on understanding the enterprise. During that phase we develop a generic diagram of the enterprise, define value chains, and identify stakeholders. This chapter focuses on understanding enterprises.

The Traditional View of an Organization's Structure

In *Improving Performance*, Rummler and Brache provided a nice example of the distinction between the thinking of those who rely on organization charts and those who focus on processes. When asked to describe their organizations, most managers will draw something like the traditional organization chart shown in Figure 3.3. In some cases they will simply give the various groups or departments names, such as marketing and production. In other cases they will detail who manages each department and to whom they report. This kind of information is often useful. But, it is important to notice what kinds of information a traditional organization chart does not provide.

First, an organization chart does not show the customers. Second, and equally important, it does not show the products and services the company provides to

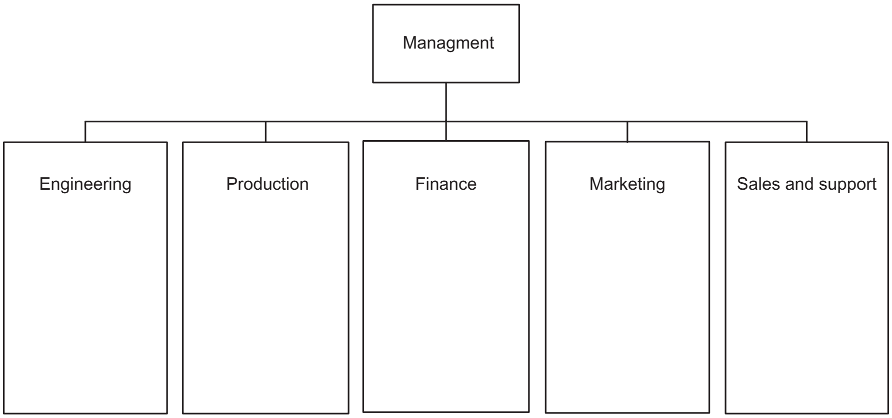

FIGURE 3.3

Traditional organization chart.

customers, or where the resources needed to create the products and services come from in the first place. It certainly does not show how work flows from one activity to another before ultimately being delivered to a customer.

A manager might reply that an organization chart is not expected to show such things, and we would agree. Then, we would ask our manager to show us whatever charts he or she uses that do show those things. Most managers are not prepared to create or show diagrams that provide a systems or process-oriented view of their organizations.

Traditional organizational charts are often described as a vertical view of the organization. The departments or functional groups within a department are referred to as "silos," similar to the tall, windowless grain storage buildings one sees in farming regions of the United States. When managers conceptualize their organizations as vertical organizations they tend to manage in a vertical manner. They focus on who reports to whom, and set goals for each group independent of the others. At the same time *silo thinking* leads managers to focus on making their departments as efficient as possible, without much regard to what is going on in other silos. When cross-departmental issues arise they tend to get bounced up the reporting chain until they reach a manager who is responsible for the work done in both departments. That, in turn, guarantees that senior managers spend much time resolving cross-functional or interdepartmental problems that could have been better resolved at a lower level by people with a much better grasp of the specific problem. And, of course, the time that senior managers use for resolving these cross-functional disputes is time they do not have to focus on customer concerns, on creating new strategies, or on improving productivity.

This problem has been widely discussed since the late 1980s. Many books have been written about the problem. Silo thinking tends to lead to departmental or functional suboptimization. This often occurs at the expense of the whole organization. An obvious example would be a sales department that gets praised for selling lots of products without considering that production cannot deliver the products in time to meet the delivery dates promised by the salespeople. Or it could be an engineering department that creates a product that is efficient to manufacture, but does not have the feature set that marketing has promised or that salespeople can most readily sell. In essence, suboptimization occurs when one process within one silo is improved at the expense of other processes in other silos, or at the expense of the value chain as a whole.

Managers, like all people, tend to think in terms of their models. There is a saying in the medical profession that, when undertaking a diagnosis, physicians only find what they are looking for. Managers are the same. To think of organizations as wholes, managers need to learn to visualize their organizations with diagrams that provide insight into how their organizations actually work, as a whole. They need to think in terms of organizational systems and value chains, rather than thinking primarily in terms of divisions, departments, or their own functional unit.

A Case Study of Organization Transformation

John Roberts is a professor of strategy and management at Stanford University and the author of a popular book, *The Modern Firm: Organizational Design for Performance and Growth*. I discussed the book on the BPTrends website when it first came out; at that time I remarked on the fact that the book only had one reference to process in the index and that referred to process control. I did not find this unusual because most business schools do not, in general, have a business process orientation. Despite this, however, *The Modern Firm* is a good book with much interesting information about how companies approach strategy and organizational design. Recently I found myself reading *The Modern Firm* while researching a strategy question. As I read it, I became focused on a case study describing how BP made strategic and organizational changes to improve the performance of the firm. It is a great case study, from my perspective, because it has so much to say about the importance of business processes, and I decided to share it with readers, while putting my own spin on Roberts' explanation.

The case occurs in a chapter on Organizing for Performance. From Roberts' perspective it is a matter of developing an efficient reporting structure and disaggregating overly complex organizational designs. The chapter focuses on BP, a major oil and gas company. In the early 1990s, BP was in trouble and the financial crisis of 1992 nearly resulted in bankruptcy. By the early 2000s the firm recorded some of the highest profits ever reported by any firm in history. The question that Roberts asks is how BP managed the transition.

The transition began in 1989 when BP hired Robert Horton as CEO. When Horton was hired, BP's corporate headquarters was a 32-story building filled with staff people. The company's performance was declining and the company was heavily in debt. Horton's initial days were focused on meetings with some 86 different executive committees.

Horton's first decision was to focus on the organization's core business and to sell businesses that did not support that focus. As a result of several executive meetings he decided that BP was composed of three "business streams." (We would have called them processes, but more information will be given later.) The three streams were as follows:

- Upstream Oil and Gas Exploration and Production
- Downstream Petro Refining and Marketing
- Downstream Petrochemical Products

The upstream process fed both of the two downstream processes. Horton concluded that there was no special value generated by internal transactions among the three streams and that they could be decoupled and run independently. (Put a different way, BP's upstream unit could sell to any of several refining companies and BP's downstream petro refining and marketing unit could buy oil and gas from any of several production companies. In all cases the only important consideration was getting the best price).

Once Horton reached this conclusion, he changed the management structure and appointed individuals to head each of the three "streams" and then proceeded to assign responsibilities to the three stream managers while simultaneously eliminating jobs at the corporate headquarters. (In effect, Horton had identified three value chains and had created a business process manager for each chain.) At the same time, Horton began to sell the business units that were not part of one of the three core streams he had identified. From 1992 to 1995 BP decreased from 97,000 employees to approximately 50,000, and the staff at BP's headquarters was reduced by 80%.

In 1992 BP had a loss of $811 million and by 1994 BP had a profit of $2.4 billion. During the same period BP's debt decreased by $4 billion. After starting the transition to an organization structure based on the three core streams, Horton was replaced by David Simon, who proceeded along the same lines that Horton had defined.

During this period the biggest changes were occurring within the upstream unit, headed by John Browne (who was to become CEO in 1995). Browne began by asking the question: What is the BP upstream good at? The upstream team concluded that it was good at exploiting large hydrocarbon deposits that required sophisticated technology and heavy capitalization. Other competitors could exploit smaller deposits more efficiently, but BP could manage high-risk projects better than its competitors. This strategy led BP to focus on areas like the North Sea, the North Slope of Alaska, and Russia.

Browne organized the upstream unit (called BPX for BP eXploration) into regional operating companies (ROCs) that each consisted of a specific field, or a closely related group of fields, and assigned independent managers for each of the ROCs. He also significantly increased the responsibilities of each ROC manager.

In the past BP had focused on aggregated performance numbers. Browne switched to performance data for each ROC so that the performance of each ROC could be compared. Henceforth, each ROC head negotiated directly with BPX for his or her budget. At the same time, Browne tied not only executive compensation, but all employee incentives, to the performance of their individual ROCs. (Put a little differently, Browne broke an abstract "value chain" into several concrete instances of a generic value chain and then assigned process managers for each specific value chain. And he made compensation dependent on the performance of the specific value chain.)

As time passed the ROCs began to complain that some of the comparisons were unfair. At the same time, Browne and the ROC managers realized that even as they were becoming more efficient, they were failing to share knowledge and insights among the various ROCs. At this point Browne and his team classified the various ROCs according to where they were in the BPX life cycle. All ROCs were divided into one of four groups:

- Exploration Rights Being Developed
- Assets Being Brought into Production
- Full Plateau Production
- Fields in Decline and Ending Production

ROCs in the same life cycle group were termed “peer groups” and were compared during evaluations. They were also encouraged to share information. (In essence, BPX realized that there were subprocesses within the overall value chains that were in fact common processes, and that they should use the best practices achieved by any one instance of a common process to improve all similar processes.)

Roberts believes that Browne’s innovations were directly tied to BP’s increased success, and after Browne become CEO of BP in 1995, his approach was applied across the entire company. Roberts also believes that BP’s successes are the result of strategic focus and better organizational design. Obviously, how the reader understands the example will depend on how he or she understands BPM. We believe that BPM is in essence a management philosophy, and that it involves doing everything possible to improve the performance of the organization. Thus, we believe those involved in BPM are as much concerned with customers, employees, strategy, and the management of the organization as they are with workflow or the automation of activities.

We normally recommend that every organization begin by creating a strategy that defines its core strengths. We would then recommend that it then move on to creating a business process architecture, as Horton and Browne did, to define how its processes support its strategy. Then, we would recommend that managers be assigned the responsibility for managing the processes, whether they are called processes, streams, business units, or value chains, and that their compensation be tied to results. We think it is really important to do as Browne did and set process incentives, not just for senior managers, but for all employees, to ensure that everyone understands exactly what they do to generate value for the firm and that they are rewarded on the basis of how well they do it.

Finally, we believe that modern organizations must also work to identify common processes and use that information to ensure that best practices are used for all similar work. Although Roberts did not mention it, common processes tend to use similar software and one key to efficiency is to ensure that the same software modules are used for common processes. The alternative is a proliferation of enterprise resource planning modules, each supporting a similar process, but each tailored in a slightly different way—creating a maintenance nightmare.

John Roberts terms the BP case study a triumph of strategic focus and organizational redesign. We call it improved process management. Perhaps what you call it does not ultimately make much difference. But, how you explain it does. Roberts assumes that BP was improved because great managers arrived at uniquely insightful solutions. We would not want to disregard the important role of great managers, but we believe that overall what the managers did was more predictable than that. BP evolved into a more mature process-focused organization, and its executives did exactly what BPM gurus, like Hammer, Rummler, and Davenport, have consistently recommended. Define processes top-down. Assign process managers and make them responsible for results. Measure process results; do not just focus on arbitrary departmental results. Align measures and strategic goals. Eliminate or outsource noncore (nonvalue-adding) processes. Focus employees on their roles and responsibilities in creating value, and reward them for results. Identify and standardize common processes throughout the organization.

Processes describe how value is created. Smart executives naturally tend to focus on processes because they are concerned with results. BPM merely captures these insights and provides a structured approach.

The Systems View of an Organization

One alternative to conceptualizing an organization in terms of its departments and reporting relationships is to imagine an organization as a system that responds to inputs and generates outputs. This view is often referred to as a *horizontal* or *systems view* of the organization. Figure 3.4 illustrates a horizontal view of an organization. In this case we provide a high-level systems view of a hypothetical restaurant called San Francisco Pizza (SF Pizza).

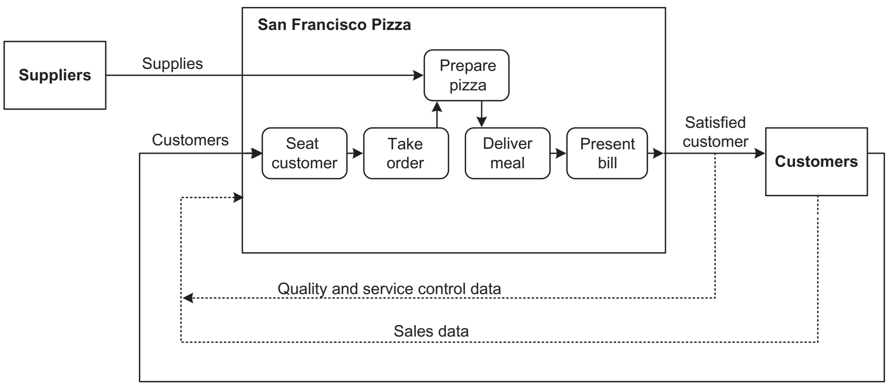

FIGURE 3.4

Systems view of the SF Seafood company.

The organization illustrated in Figure 3.4 is at such a high level of abstraction that it could be any organization. Much that could have been added has been omitted to simplify this diagram. This view provides us with much information that we do not get from an organization chart. First, it shows customers, products, and suppliers. Second, it shows how work actually occurs. Third, it gives us an idea of how things are connected and flow from one thing to another—how raw materials flow to meals and how data about customer satisfaction flow back to the organization.

A systems view emphasizes processes and connections and, ultimately, adaptation. What would happen if the restaurant was closed for a period of time? You would need to stop some supplies. You would lose some customers. A systems diagram provides a snapshot of how the key elements of your organization work together to achieve its goals.

Models and Diagrams

In this book we will use two broad classes of diagrams: *organization diagrams* and *process diagrams*. In this chapter we will focus on the basic notation used for organization diagrams.

As we have suggested, many different groups are involved in business process modeling. Predictably, different groups use different types of diagrams. Even within a relatively well-defined community, like workflow software vendors, a dozen different notations are used. Some of the notations are different from one another, stressing different ways to view organizations or processes. Some notations differ on such trivial matters as whether a process should be represented as a rectangle or a rectangle with rounded corners.

The key thing to think about in selecting any notation is who is going to use it. We assume that the diagrams described in this book will be used by business managers, business analysts, and process practitioners of various kinds. They may also be used by software developers, but software developers are not our primary audience. Hence we have constrained the types of things we describe in diagrams to the things most managers are interested in, and omitted notation that is only used to describe software conventions. Furthermore, although we recommend the use of software diagramming tools for some purposes, we assume that many managers will create diagrams of their organizations and processes on drawing pads, blackboards, or relatively simple diagramming tools, like Visio or PowerPoint. Hence we have made every effort to use simple, easy-to-understand conventions.

Our goal was to arrive at a way of describing organizations and business processes that is as easy to understand as possible, while still making it possible to describe all the basics that need to be described. In this chapter, as we describe the notation, we will not consider how it might be implemented in a software tool. Several tools, however, implement notations similar to the one we use and thus in later chapters we will show how software tools can be used in process redesign to simplify the creation of organization and business process diagrams. At this point, however, we only want to provide readers with the basic notational elements necessary to draw models of their organizations and business processes. We will begin by explaining the basic elements of an organization diagram. Then, we will proceed to show how this type of diagram can be used to define an organization's value chains, specific value chains, stakeholders, and high-level organizational concerns.

Organization Diagrams

Organization diagrams are an extension of systems diagrams that are modified so that they can be used to describe the basic structure of an organization, the relationship of the organization to its external environment, and the relationships among the departmental units within the organization. In some cases they may also show the basic processes used by the organization and how those processes relate to the basic departmental units.

Figure 3.5 provides a high-level picture of an organization. Rummler and Brache refer to this diagram as a supersystem diagram to emphasize that it focuses on what happens outside the organization rather than on what occurs inside. This is the kind of diagram a strategy committee might use to picture the relationships between your organization and those it depends on.

The shaded square in the center represents the organization. In this initial version of the diagram we do not show any internal detail, because we want to focus on the inputs and outputs of the organization.

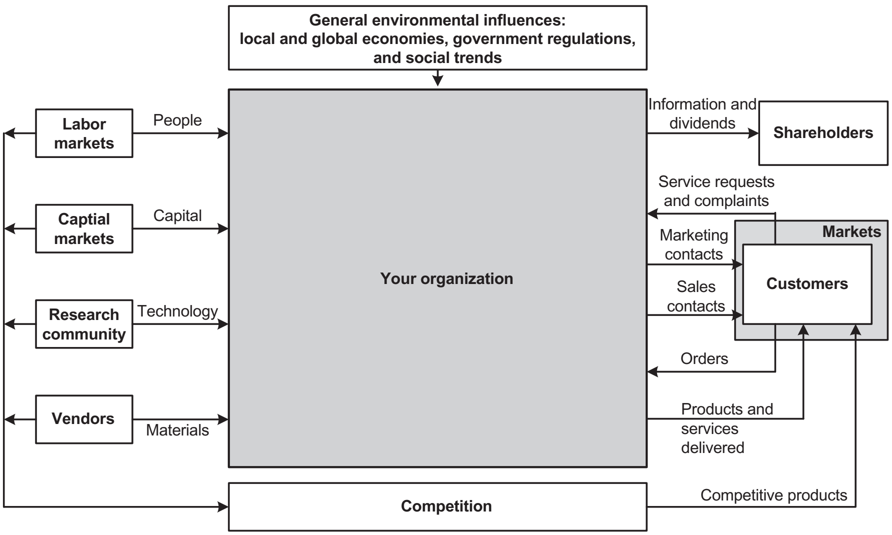

FIGURE 3.5

Organization diagram that emphasizes external relationships.

Modified from Rummler-Brache.

Suppliers of all kinds, including vendors who supply materials, research organizations that supply new technology, capital markets that supply money, and labor markets that supply employees, are shown on the left of the business.

Customers and shareholders are listed on the right. Customers order and receive products and services. Shareholders buy stock and receive information and dividends.

Below the company box we have a rectangle for competitors, companies that compete with the organization for inputs from suppliers and for customers. If the organization we are describing has one or a few major competitors we may list them in separate boxes to help focus everyone on the nature of the competition.

Above the company box we have a rectangle that includes more generic environmental impacts on the business. These could include government regulations, changes in the economy, or changes in popular taste.

The detail one provides on this diagram depends on the purpose it is being used for. In strategy discussions it is often important to show specific types of customers, specific suppliers, and even particular competitors. Later, when one is primarily focused on the relationships between departments and on analyzing internal processes, the external details can be removed to better focus the discussion.

We believe that the organization diagram shown in Figure 3.5 can be used to describe every possible type of organization, including monopolies and government entities. Indeed, we have used these diagrams during consulting engagements with all these types of organizations. The names may change a little, but all organizations are systems, and they must all obtain supplies and generate products or services, just as they all have some kind of competition and operate under some type of environmental constraints. Governments and government agencies don't have stakeholders, of course, but they have citizens or legislative committees they report to, and they have budgets and goals or targets they use to measure their successes.

Organizations and Value Chains

We defined the idea of a value chain in Chapter 1 (see Figure 1.4) and referred to it again in Chapter 2. It is a powerful concept and should be used to focus attention on the fact that all the processes that go into making and selling a product line ought to be considered as parts of a whole. Unfortunately, it is easier to talk about a value chain than to define it in many specific contexts.

Small or focused organizations tend to have a single value chain. In essence the whole organization is a system designed to produce a single product or service. In such a case the value chain and the organization are interchangeable terms. Large or more complex organizations tend to have more than one value chain. In this case the organization as a whole is the ultimate system or process and it is then divided into two or more value chains, each producing a more or less independent set of products or services. The important thing to remember is that a value chain is just another name for a process. If the term "value chain" (or its increasingly popular equivalent, a "value stream") is confusing at all, just ignore it and speak of the top or largest processes in the organization.

To begin with, there are always arguments between the "lumpers" and the "splitters." The lumpers want to combine everything that is even vaguely similar and arrive at one or a few value chains. The splitters want to focus on the differences between different products and different groups of customers and usually end up generating a rather longer list of value chains. Consider whether General Motors supports one value chain, or several. It would be possible to argue that each line of cars represents a different value chain with a different group of customers. Or, perhaps, you might argue that all cars are similar and represent one value chain, while trucks are rather different and represent a second value chain. Most analysts would probably separate the manufacture of automobiles and trucks from GM's financial operations, and argue that one is a manufacturing value chain while the other is a financial value chain. In fact, however, GM often uses its financial group to support auto sales, offering auto loans without interest for a period of time to encourage sales. Thus it would be possible to argue that even GM's financial group is a process within a broader autos value chain. The goal of a value chain analysis is to ensure that all the processes involved in the creation of a product line are considered together. Each company will need to determine for itself exactly how broadly or narrowly it wants to use the term "value chain." There is no right answer. A workable answer usually emerges from a discussion among senior managers.

Another source of confusion derives from the growing use of outsourcing. Figure 3.6 provides one way of thinking about how Dell Computer's laptop value chain is organized. Dell focuses on designing new laptop computers as components become available, marketing its computers and selling computers online via its website. Once a laptop is actually ordered Dell transmits the order to an outsourcer in China, who assembles the actual computer and ships it to the customer. If the computer subsequently requires service the customer calls an outsourcer, who diagnoses the problem and schedules a pickup. An outsourcer picks up the computer and delivers it to a warehouse run by another outsourcer, who makes the needed repair and returns it to the customer.

One could argue that Dell is simply a design and marketing organization and that laptop manufacturing is not one of its core processes, but Dell is generally classified as a computer equipment manufacturer, and Dell exerts significant control over the processes it has outsourced. On the other hand, Dell does not have a laptop-manufacturing function or a vice president of laptop manufacturing with day-to-day control of computer assembly. That role is performed by an individual working for an outsourcer. More and more companies are trying to think about how a value chain works if significant operational processes are controlled by external organizations. Put a different way, organizations are beginning to talk about value chains that extend beyond the traditional boundaries of the organization. Some refer to this type of diagram as a *value chain system*.

Another aspect of the value chain concept that many companies find difficult is the requirement that overhead, management, and support processes be combined with primary or core processes. Porter suggested that a company should be able to isolate all the support activities that are used in a single value chain. Most companies

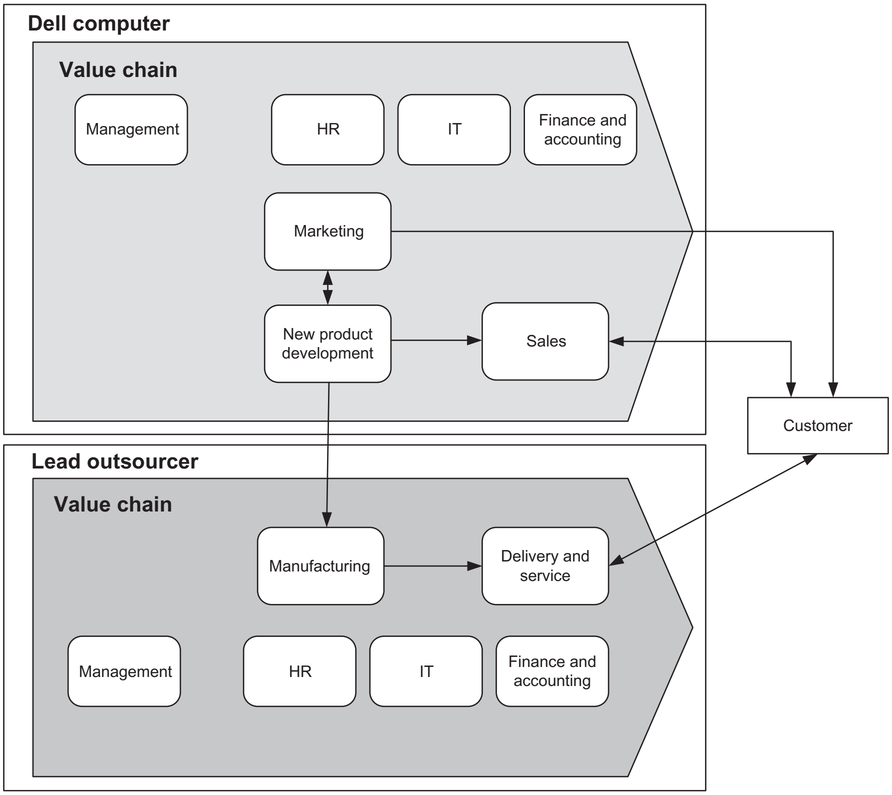

FIGURE 3.6

Dell laptop value chain.

find it easier to organize their senior management activities (e.g., corporate image, corporate strategy, stockholder support) and their major support processes (e.g., personnel, IT services) into separate processes that are independent of their value chains and then use some overhead formula to assign a portion of the cost of these management and support processes to each independent value chain. Like Dell, some companies outsource their HR or IT processes to other organizations. In this case one organization's support process is another organization's core process.

In the 1990s most companies focused on improving their core processes. In recent years a lot more attention has been focused on management and support processes, but most companies still find it easier to define their value chains only in terms of core processes and to exclude management and support processes. Some organizations use the term *value stream* as a way of emphasizing that they are only speaking of core processes when they use the term. (Other firms use the terms *value chain* and *value stream* as synonyms, so one needs to determine just how a given company is using the term before drawing any conclusions.) Throughout the rest of this book we will use value chain and value stream as synonyms and use them to refer to either a large process that includes only core processes or a top-level process that includes both core processes and management and support processes. This accurately reflects the flexibility that we encounter as we move from one company to the next.

However the concept is defined, each company needs to determine how many value chains it has. A business process architecture describes a single value chain. It is simply too complex to try to analyze more than one value chain simultaneously. Thus one begins by defining the value chains in a company and then, thereafter, one always focuses on one specific value chain at a time.

Figure 3.7 illustrates an organization diagram that shows that a given company has two value chains. An example of such an organization might be Michelin, which sells both tires and restaurant guidebooks. However it might have begun, today Michelin has two value chains selling two different types of products to two different audiences. In this diagram we have pictured a company with two value chains. Separately, we included process boxes (rectangles with rounded corners) for an organization management process, as well as for IT, personnel, and for a finance process that monitors the organization's use of capital.

So far, our organization diagram only pictures a very high–level overview of an organization and its largest processes. Sometimes we want to drill down and look at only a single value chain. To be more concrete let us assume that the organization pictured in Figure 3.7 is Michelin, and that it has two rather separate lines of business. Imagine that we only wanted to focus on the *sell tires* value chain. In this case we might create an organization diagram like the one shown in Figure 3.8. It pictures a single value chain, which is indicated by the label on the central box, and shows the major processes that comprise the *sell tires* value chain.

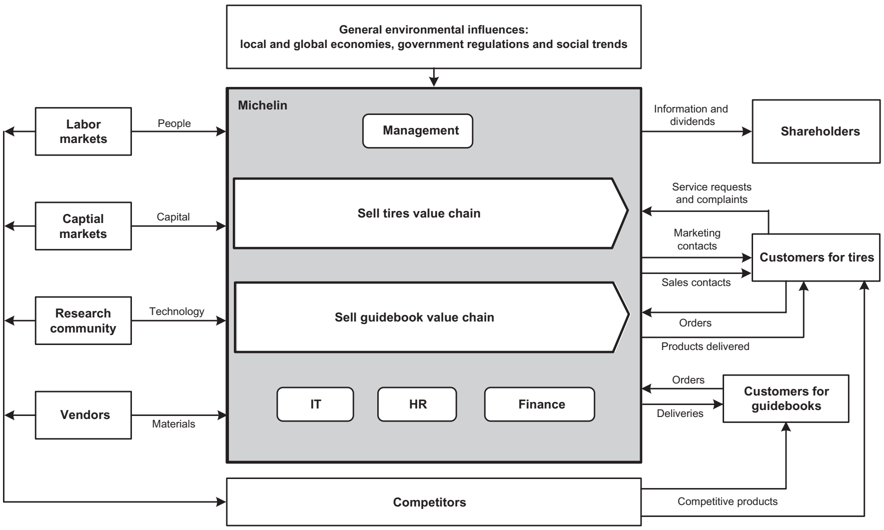

FIGURE 3.7

Organization diagram of a company with two value chains.

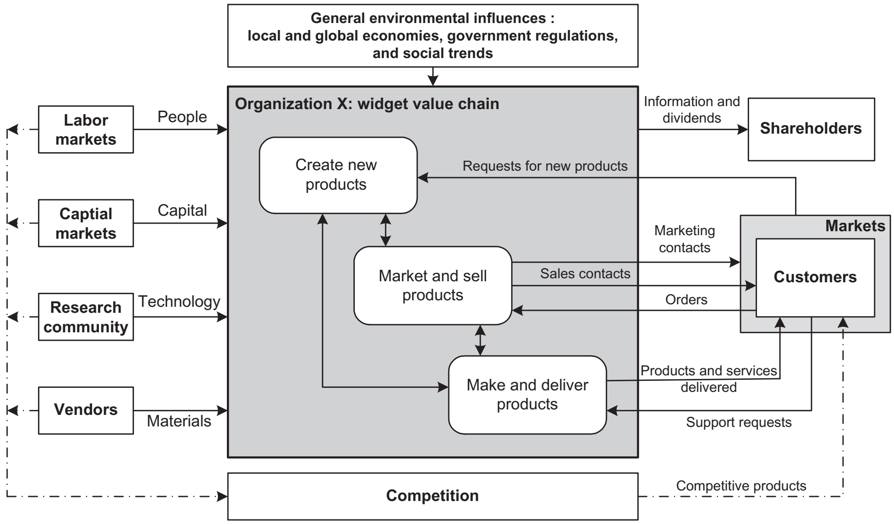

FIGURE 3.8

Organization diagram for a specific value chain with three core processes identified.

Some analysts would take this one step further and identify some of the subprocesses within the three core processes we have shown in Figure 3.8. In some cases this may be useful, but in most instances we find the level of analysis shown in Figures 3.7 and 3.8 to be sufficient. The goal of an organization diagram is not to define processes in detail, but to get an overview of the whole organization and to help the team think about customers, value chains, and major stakeholders. We have better techniques for analyzing and picturing the details of processes and subprocesses.

Systems and Processes

We began our discussion of how managers understand the enterprise by considering the kind of model that a manager might provide if asked to explain the organization he or she managed. The traditional organization chart that we guessed our manager might provide is a pretty static way of looking at an organization, and it does not provide a good way of thinking about how things are related. It leads to silo thinking.

In this book we urge *systems thinking* and *process thinking*. As organizations become more complex, effective managers need an overview that allows each one to see how their work fits within the larger whole. Peter Senge wrote a popular book a few years ago that called systems thinking the "Fifth Discipline" and argued that every manager should cultivate this perspective. We believe that the organization diagrams that we have presented herein provide an important first step toward developing a systems overview. We know that anyone involved in trying to implement a business architecture needs this kind of perspective. The alternative is to try to figure out how to assign strategic goals to departments without a clear idea of how the departments work together to achieve the desired outcomes.

Process thinking is just a subset of systems thinking. Systems thinking puts the emphasis on understanding the organization as a whole. Process thinking stresses thinking about a portion of the system that produces a specific set of results. The key, again, is to think of the entire process, to understand how a specific process fits within the larger process and, ultimately, within the value chain. Remember, departments do not produce profits; value chains and processes produce profits. An excellent department may not result in a great process or significant profits. Indeed, in many cases maximizing departmental efficiency actually reduces the efficiency of the whole process. To avoid this, organizations need to focus on the flows and relationships that actually add value and produce products for customers. Older perspectives need to be subordinated to these newer perspectives if your organization is to prosper.

Notes and References

Rummler, Geary, and Alan Brache, *Improving Performance: Managing the White Space on the Organization Chart*, Jossey-Bass, 1990. The book is out of date in the sense that diagramming elements are defined in ways that are pre Unified Modeling Language and Business Process Modeling Notation and we have changed various diagrams to bring the Rummler-Brache diagrams into line with current practice.

Geary Rummler's last position was with Performance Design Lab (PDL) and they give workshops on advanced process analysis and design issues. More information is available at http://www.performancedesignlab.com. Those who have taken a Rummler workshop know that PDL makes extensive use of a set of organization and process diagrams of a Fine Times Restaurant he has created. In effect, our SF Seafood restaurant is a West Coast branch of Fine Times and owes much to the original in Tucson.

Magretta, Joan, "The Power of Virtual Integration: An Interview with Dell Computer's Michael Dell," A Harvard Business School Case Study and Commentary, March 1998, available at http://www.hbsp.harvard.edu.

Roberts, John, *The Modern Firm: Organizational Design for Performance and Growth*. Oxford University Press, 2004. Little on processes, as such, but many good studies of organizations that often rely on process principles.

Senge, Peter M., *The Fifth Discipline: The Art and Practice of the Learning Organization*, Currency Doubleday, 1994. Senge is also at the Sloan School of Management at MIT, and is a student of Forrester. Senge has created a more popular approach to systems dynamics that puts the emphasis on people and the use of models and feedback to facilitate organizational development. In the Introduction we described mature process organizations as organizations that totally involved people in constantly improving the process. Senge would describe such an organization as a learning organization.

CHAPTER

Business architecture

4

The term "business architecture" can be very confusing. In the late 1970s, when Geary Rummler first began to give courses on how to improve corporate performance, he would begin an analysis of corporate problems by working with a team of senior managers to create what he initially termed a "relationship map" and what we now call an organization diagram. Rummler's approach derived directly from his insistence on a systems perspective. In essence, an organization was a system that took inputs and generated outputs. Today we would term it a "process" but it comes to the same thing. Figure 4.1 pictures an organization diagram, much like the ones that Rummler uses in his classic book, *Improving Performance*.

In essence, Rummler used the organization diagram to help senior managers understand how the major processes in an organization related to key entities outside the organization. He wanted managers to have a broad overview of how everything was connected to everything else.

In the early 1990s Michael Hammer introduced a slightly different approach, when he wrote *Business Process Reengineering*. Hammer drew on the work of Michael Porter, a Harvard Business School professor of strategy, and emphasized the idea of a "value chain." In essence, a value chain is a collection of all the processes that an organization uses to generate a product or service that is valued by a specific group of customers. Each step in the chain adds to the final value of the product or service. Hammer was primarily concerned with discriminating between the cost of performing process work and the margin created by the costs and sale price. Figure 4.2 pictures a value chain, as Hammer conceived it, placed inside an organizational frame to make it easier to compare with Rummler's approach.

Hammer would begin an engagement with an organization by asking how many value chains the organization had. He would work with a management team to create a diagram rather like the one shown in Figure 4.3, and then ask the organization to decide which specific value chain they wanted to work on first. In Figure 4.3 we see the value chains in Unisys in 2003.

Each Unisys value chain provides a different type of product or service, and each targets a different group of customers. Systems integration sells software development services, whereas outsourcing manages the execution of other companies' software applications, and so forth.

Obviously, the main difference between the approaches of Rummler and Hammer is the fact that Rummler assumed an organization had one value chain—as most midsized organizations do—whereas Hammer assumed that the organization might have

Business Process Change. https://doi.org/10.1016/B978-0-12-815847-0.00004-2

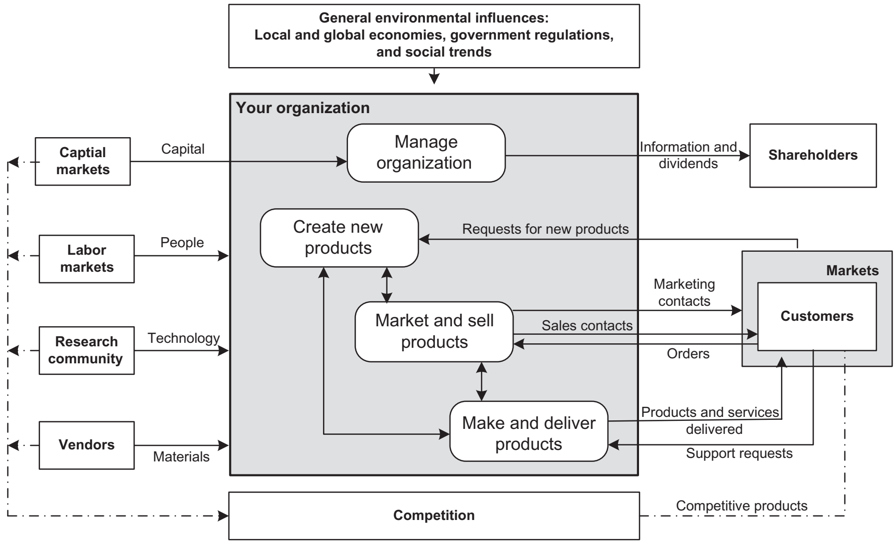

FIGURE 4.1

An organization diagram.

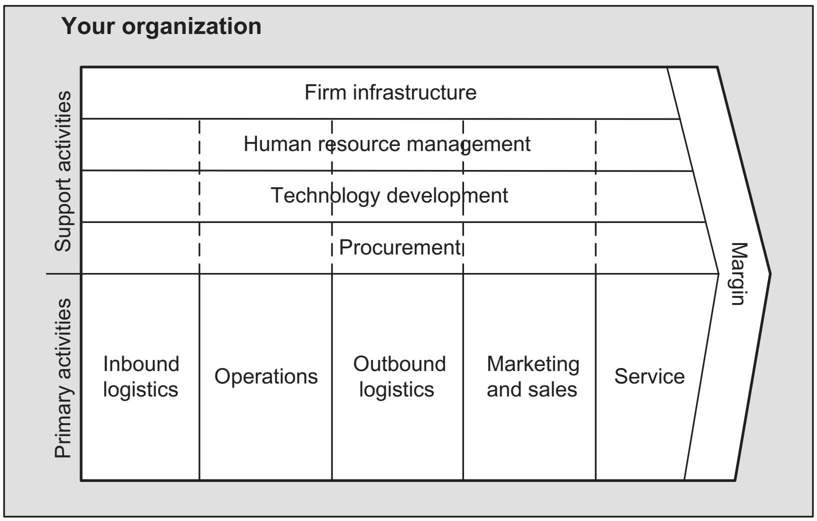

FIGURE 4.2

Value chain in an organization box.

more than one value chain, as many large organizations do. The processes pictured on Rummler's relationship map were the Level 1 processes that might make up a single value chain, whereas Hammer's diagram just shows value chains and doesn't subdivide them into major subprocesses. Today we combine the two approaches. We do one diagram, like Figure 4.3, to show that an organization has more than

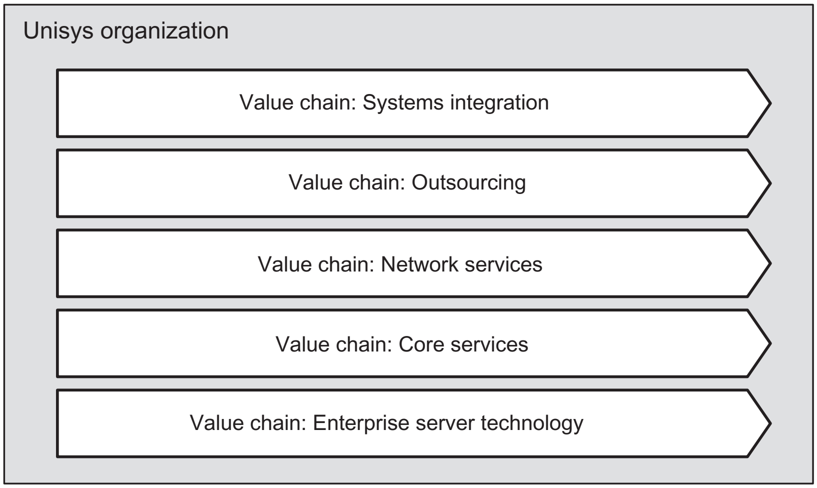

FIGURE 4.3

Organization with multiple value chains.

one value chain. Then, having selected one of the value chains to focus on, we do an organization diagram to zero in on the high-level processes within a single value chain.

It's common to speak of organizations as having a corporate strategy and goals. In fact, if you actually look at the strategy and goal statements of large organizations, you will find that they tend to have different strategies and goals for each of their major value chains. Thus, the goal for improving tire sales or reducing the costs of tire production this year is probably quite different than the goal for improving guide sales or reducing guide production costs this year. In essence, each major value chain has its own business model. When one is trying to think broadly about an organization it's very important to determine if the organization has one basic value chain, or has more than one. If an organization has more than one value chain, then each needs to be considered independently—since goals, processes, and customers will all vary according to which value chain you focus upon.

Most early business process redesign work was focused on major processes that management wanted to improve. Consultants were hired in effect to do something, such as "fix the sales process." In those circumstances the process consultants didn't want to spend too much time on architecture, which companies did not tend to value, but they did want to get a good overview of the business situation before they started to focus too narrowly on a specific process. In those circumstances approaches like those used by Rummler and Hammer tended to work well. One began with a high-level view, identified a half dozen major business processes, and determined how they related to the process one was being asked to redesign. In essence, the architecture work established a context for the more detailed process analysis work that one did as one zeroed in on the specific process one had been asked to improve. (We'll return to simple architectures when we consider how to do process redesign.)

The Supply Chain Council's Supply Chain Operations Reference Framework

The first work on a more modern concept of a business architecture was probably initiated by the Supply Chain Council (SCC)—an association of organizations that joined together to develop standards for supply chain development—in the mid-1990s. The supply chain managers ended up developing a standard architecture for a supply chain that companies could use to define their own supply chains and how their supply chains connected with other supply chains. Figure 4.4 shows an overview of the basic Supply Chain Operations Reference (SCOR) model that the SCC developed. In essence, the SCC standards team developed a three-level model. They treated the value chain as Level 0, and treated a given supply chain as Level 1. They subdivided a supply chain into four major subprocesses: *source*, *make*, *deliver*, and *return*. In addition, they identified a process that they termed *plan*, which was required for every other process. In essence, they were saying that each supply chain, and each specific *make and return* process required a management process—which

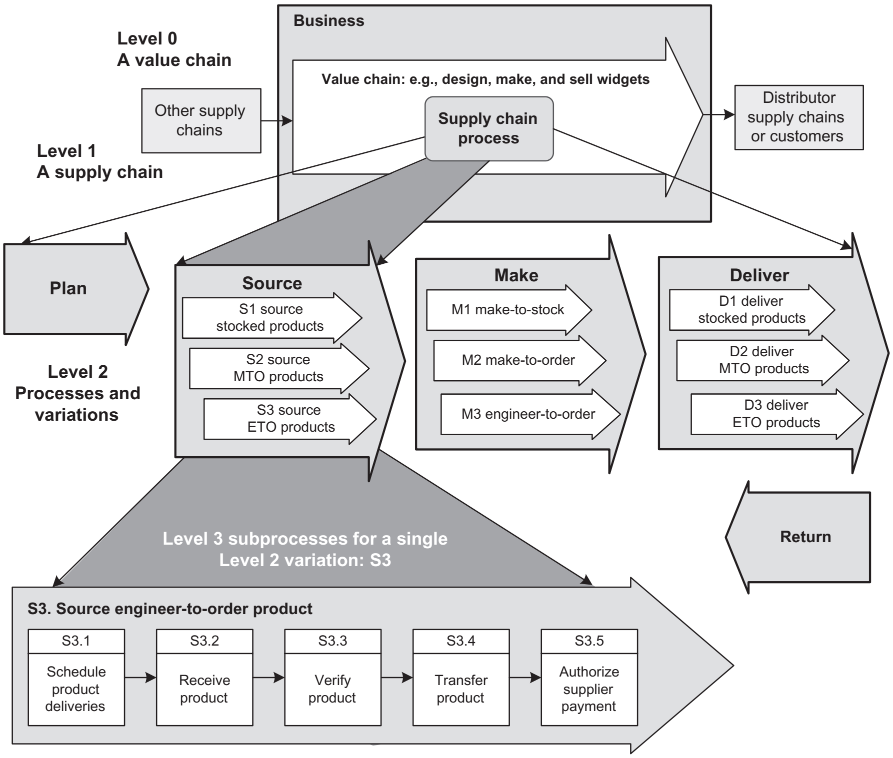

FIGURE 4.4

Three levels of the SCOR framework.

they called *plan*—to control it. They recognized three variations on each of those subprocesses, and defined a set of subprocesses for each of them.

They also recognized that there was a problem if they tried to go below Level 3, since the flows became too complex to model. Instead, they settled for showing specific Level 3 subprocesses, and then showing only the other processes, people, or organizations that the specific Level 3 process interacted with. At the same time the SCC team developed their basic models, they also developed a basic approach to performance evaluation and metrics for each process and subprocess. Figure 4.5 pictures a set of metrics for a supply chain (a Level 1 process). Note that the metrics are arranged so that some measure reflects how the supply chain performs relative to its customers, and the other set reflects the internal performance of the supply chain.

Working together, the SCC member organizations—there are some 900 members today—established a benchmarking service. There were enough members to assure that companies could get benchmark data for whatever industry they were in, and compare the average and the best organizations with their own specific performance. This, in turn, enabled an SCC member to determine just how well its own supply chain was working.

Note the subtle difference that has taken place. Earlier business process groups defined business process architectures to help in the redesign of a specific business process that was broken. The SCC defined a business architecture to allow companies to quickly define how their supply chains worked, and then to assure that they could get good data on the actual performance of their existing supply chain. Using the data they got an SCC member could determine which of its processes were working as well as others in its industry, and which were superior or substandard. Knowing what most companies were able to achieve a given company could do a calculation

Supply chain SCORcard				*Performance vs competitive population*			
	Overview metrics	SCOR Level 1 metrics	Actual	Parity	Advantage	Superior	Value from improvements
External	Supply chain reliability	Delivery performance to commit date	50%	85%	90%	95%	
		Fill rates	63%	94%	96%	98%	
		Perfect order fulfillment	0%	80%	85%	90%	$30M revenue
	Responsiveness	Order fulfillment lead times	35 days	7 days	5 days	3 days	$30M revenue
	Flexibility	Supply chain response time	97 days	82 days	55 days	13 days	Key enabler to cost and asset improvements
		Production flexibility	45 days	30 days	25 days	20 days	
Internal	Cost	Total SCM management cost	19%	13%	8%	3%	$30M indirect cost
		Warranty cost	NA	NA	NA	NA	NA
		Value added employee productivity	NA	$156K	$306K	$460K	NA
	Assets	Inventory days of supply	119 days	55 days	38 days	22 days	NA
		Cash-to-cash cycle time	196 days	80 days	46 days	28 days	$7M capital charge
		Net asset turns (working capital)	2.2 turns	8 turns	12 turns	19 turns	NA

FIGURE 4.5

SCORcard with actual and benchmark data.

to determine what it might cost and what they might ultimately save if they were to bring a given subprocess up to the industry average, or improve it so it was as good as the best in the industry. In other words, the supply chain managers were building business process architectures to manage their supply chains, to plan and estimate which subprocesses might need work, and to make estimates about what kind of improvement it might be reasonable to expect if they reached certain benchmarks.

There are several things about SCOR that are worth noting. First, it was developed by business people—by supply chain managers—and not by process people as such nor by architecture people from IT. Second, it shows why business people might want a business architecture. Their first concern was not with aligning software applications with business goals. Their first concern was understanding how the processes they had were performing, identifying how processes at one company linked with those at other companies, and then identifying which processes would be the most cost-effective to consider fixing. To the degree that SCC practitioners have expanded their model, it has been to include information about employee best practices, and not software best practices. In 2014 the SCC merged with APICS (an association of supply chain managers) and continued its work.

The work by the SCC inspired a number of other groups to develop operation reference frameworks. The telecom industry, for example, has its own reference model, the eTOM model that was developed and is maintained by the TeleManagement Forum. Any process person working in an industry that already has one of these reference models would be well advised to learn about it and use it where possible.

Building on the initial work of Rummler and Hammer, and especially on some of the operation reference frameworks developed in the past decade, organizations have become much more interested in developing business architectures. The early methods pioneered by Hammer and Rummler are no longer sufficient for a number of reasons, which we will discuss in a moment. Before we do, however, it's worth taking a slight detour to see why there is so much confusion in today's business architecture market.

Business Architecture: The IT Approach

Completely independent of what business process experts like Rummler and Hammer were doing, IT experts were working to define architectures that could show how software systems fit together. As companies had developed software applications, databases, communication systems, and then later installed PCs and developed the Internet, the world of computing had become very complex. Large companies often had hundreds of applications spread around the world, and occasionally found that different departments had paid different prices for the same software that was being used in different locations. Worse, as hardware and software proliferated, vendors introduced incompatible standards, and it became increasingly hard to see how everything could be linked together or could communicate effectively.

By the late 1980s large companies began to assign people—usually called enterprise architects—to create models that would show all the software assets an organization had, and to picture how it might all be connected. As enterprise architects developed their models, they usually paid lip service to the fact that all IT applications were intended to support business operations, which in turn were designed to implement business goals. Thus enterprise architects imagined a pyramid with business operations at the top and IT applications beneath, supporting operations. Below that there were communications networks to link the applications and databases together, and so forth. In reality, during the early days of enterprise architecture work few paid much attention to the business architecture. Instead they focused on defining the organization's IT resources, confident that the applications and databases had been developed to support the operations of the business.

An early effort to help IT designers think about enterprise architecture was undertaken by an IBM researcher, John Zachman, who created a framework that tried to identify the kinds of information that an enterprise architecture might want to talk about. In other words, Zachman's model was a way of describing the categories one might create in a database that was going to keep track of all the elements included in an enterprise architecture model (see Figure 4.6).

		Program (function)	Data	Network
Level 1	**Scope/ objectives (ballpark view)**	List of business processes (or value chains) the company supports and the goals for each process	List of things the company needs to keep track of	List of locations in which the company operates
Level 2	**Enterprise model (business owner's view)**	Business process diagrams (e.g., workflow diagrams)	High-level database models (e.g., entity-relationship models)	Map of business units (e.g., logistics network)
Level 3	**Information system model (IT designer's view)**	Application architecture: objects, components, or data flow diagram (e.g., object models, user interfaces)	Data architecture (e.g., entities and relationships)	Distributed systems architecture (e.g., component or middleware model)
Level 4	**Technology model (developer's view)**	More detailed object or component diagrams (e.g., objects, messages)	Data design (e.g., segments, rows, keys, pointers)	Systems architecture (e.g., system software, hardware, line specifications)
Level 5	**Detailed representations**	Program code (e.g., components, applications)	Data design descriptions (e.g., fields and addresses)	Network architecture (e.g., node addresses and link protocols)
Level 6	**Functioning system**	Programs being run	Actual data being created and used	Messages being sent between users, programs, and databases

FIGURE 4.6

Zachman's 1987 framework for information systems architecture.

In essence, Zachman created a matrix that identified six levels and considered three types of entities: *functions*, *data*, and *networks*. Later, as IT people became more interested in architecture, Zachman expanded his matrix and added three more rows: *people*, *time*, and *motivation*. Zachman's framework has become popular with enterprise architects, who focus on capturing information about the elements an organization must manage. Note, however, that this really isn't an architecture, it's just a list of some of the terms that an architect might use in discussing what goes on at a given organization. And it certainly doesn't put much emphasis on the central role of process in determining how everything fits together.

In the 1990s, when companies began to be serious about large-scale process reengineering, lots of people became more interested in architecture work. Carnegie Mellon's Software Engineering Institute (SEI) created a maturity model for the US Department of Defense, to help them evaluate how likely organizations were to deliver effective software on time and within budget. The maturity model developed by SEI described five levels of maturity. Level 2 organizations understood some of their processes, but not how they all fit together. Level 3 organizations took a broader view and in essence had the beginnings of a process architecture that showed how processes worked together to produce the final desired output. Level 4 organizations were even more sophisticated, and had measures for each of their processes, and managers assigned to monitor those measures and take corrective action to assure results. As the results of the SEI maturity model work became more widely known, it focused lots of organizations on the fact that they might want to develop a business process architecture that would give them insights to how everything in the organization worked together.

This in turn led to renewed efforts to develop more sophisticated enterprise architecture models. One example of recent work is The Open Group's Architecture Framework (TOGAF). TOGAF was initially established in the early 1990s, and has developed standards for the kinds of information that might be included in a comprehensive enterprise architecture. The top-level TOGAF model is pictured in Figure 4.7.

Note that the TOGAF model includes a business architecture, although it is by no means the most prominent element of the architecture. In essence, TOGAF is still very much a framework designed by IT people to help them manage the IT resources of an organization, and it makes only a passing nod to the fact that the IT resources exist to support business operations.

In the late 1990s the US Congress passed a law requiring US government agencies to develop enterprise architectures. This initiative came about as a result of committee hearings that revealed that some departments had many different copies of the same enterprise resource planning applications that they had purchased for different prices, and were maintaining via different types of contracts. Congress wanted the departments to create a high-level overview of their IT resources to avoid duplication and waste. There are several different versions of the architectures developed by the various government departments. One, the US Federal Enterprise Architecture Framework (FEAF), was created as a general reference in 2001 and is pictured in Figure 4.8.

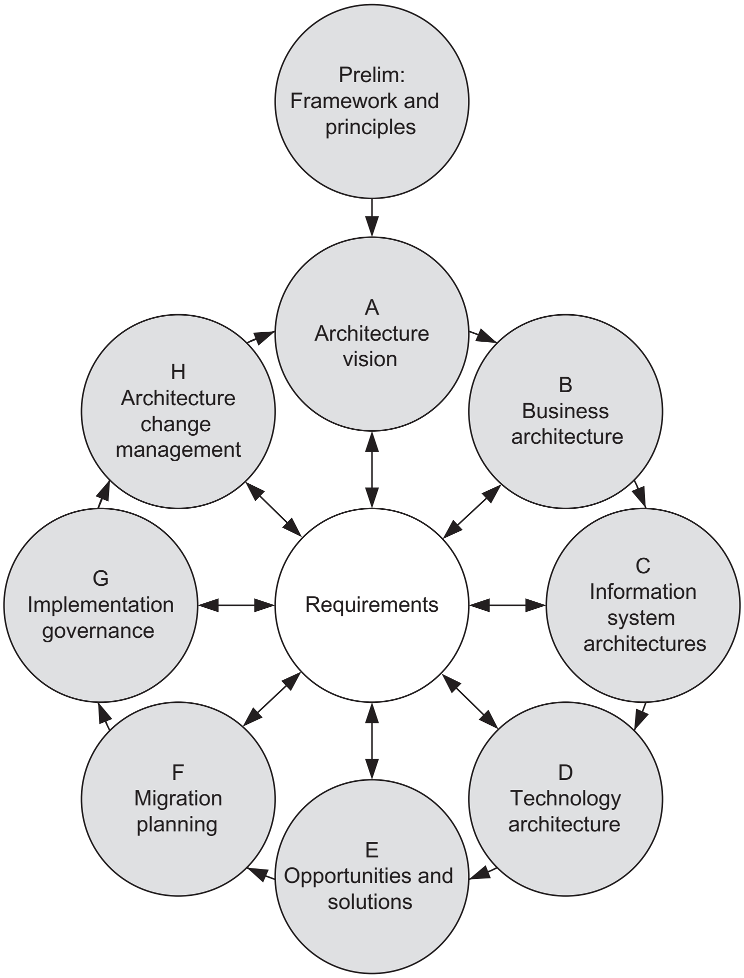

FIGURE 4.7

Open Group Architecture Framework.

As you can see by glancing at Figure 4.8, there is a place for the business architecture at the top of the pyramid, but in keeping with the emphasis on IT the real concern is with defining and linking IT resources.

A recent effort by IT experts to create a business architecture is being driven by a group of people by the software standards consortium known as the Object Management Group (OMG). The same group also has a related, independent group, the Business Architecture Guild, which is publishing a separate standard that they intend to sell, so it gets a little confusing as to whether one is talking about an OMG standard, or the Guild's Business Architecture Body of Knowledge (BIZBOK). In essence, the OMG Task Force/Guild seems to be focused on elaborating what might go

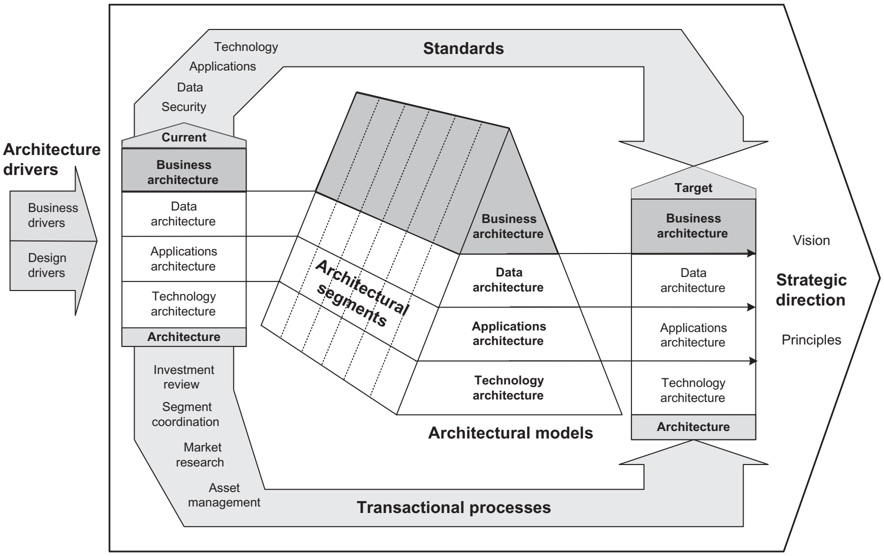

FIGURE 4.8

Federal Enterprise Architecture Framework.

in the single circle on the TOGAF model that is labeled business architecture. Their breakout of the business architecture circle is shown in Figure 4.9.

There is a sense in which process practitioners were better off, in hindsight, when the IT architects simply ignored the business architecture box on their models, and simply assumed that they somehow knew what business people wanted. The work of the OMG Business Architecture Guild is basically an effort by IT people to conceptualize what business operations must be like. They begin by setting aside process, which they define very narrowly as a rigid set of steps, ignoring value chains, and preferring to talk about value streams, which they define in a way very different from that defined by Lean practitioners. They put most of their emphasis on “capabilities,” which no one seems to be able to define. In some instances they describe a capability as a skill, as in “be able to develop applications that are Cloud-based.” In other cases they describe a capability as an activity: “Develop Cloud-based applications.” In the first case they describe a capability as something that ought to be the concern of a functional department, like IT or Finance. In other cases they define a capability as an activity that ought to be included in a business process. In all cases they imagine that an organization would want to develop a hierarchy of capabilities that an organization might support.

Those who come from the business process tradition are mostly appalled by the BIZBOK approach. From Rummler to Hammer, process people have been trying to get organizations to deemphasize functional silos, and to focus instead on how work actually gets done. If one focused on the process that generates value, then one can determine the value of any specific activity (or capability) by determining whether it contributes to the creation of value or not. Imagine an organization whose IT depart-

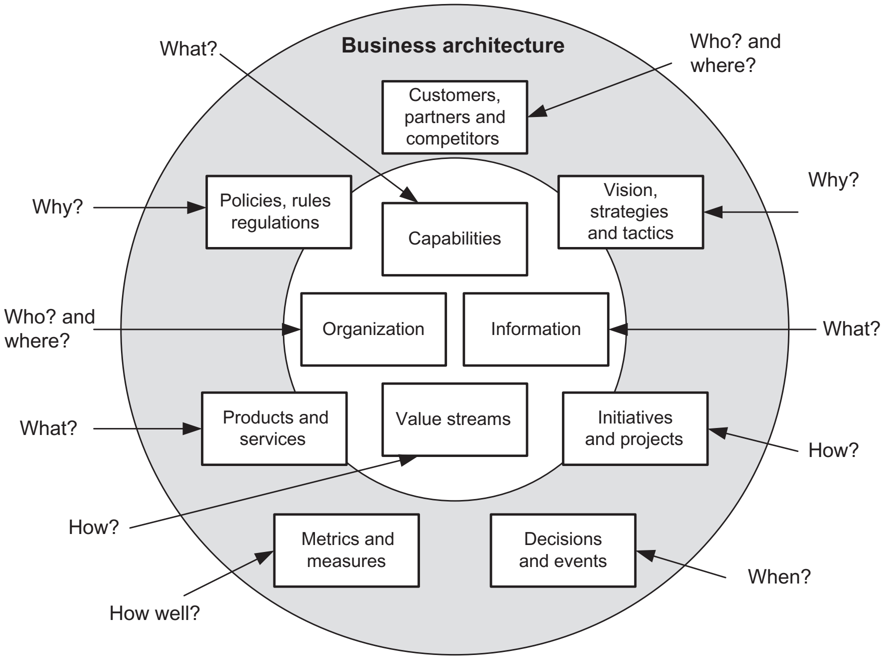

FIGURE 4.9

BIZBOK business architecture model.

ment decides it needs the ability to generate Cloud applications, and starts spending money to acquire such a capability. A look at the business process architecture, however, reveals that the company doesn't have any applications that require Cloud applications and no plans to develop any. In essence, the IT group has become focused on a nonvalue-adding activity and should be challenged, not encouraged. The capabilities modeling approach has companies making lists of things they do, or want to do, that may or may not be adding value. It's approaching architecture development backwards.

Hopefully, as time passes the various types of practitioners will meet together and develop a more holistic vision for what should be included in a business architecture. Meantime, in essence, we have two different groups, those with a business process background and those with an IT background, each offering their own version of the kind of business architecture an organization needs, and the resulting struggle is causing quite a bit of confusion.

Business Process Architecture

Suffice to say that this book is written by a business process advocate, who believes that processes, and specifically the idea of the value chain, should play a major role in business architecture. Thus in the remainder of this chapter we will focus on how an organization creates and uses what we will term a business process architecture, to avoid any confusion.

To further clarify, we need to discriminate between the use of the term "architecture" to refer narrowly to a process model or diagram, and the broader use of the term that includes not only the process model, but a process measurement system, a process management or governance system, and some way of aligning business processes with support resources. Working in the tradition of the Capability Maturity Model we hold that mature organizations not only know how their processes fit together, but they also know if their processes are working correctly, they have people responsible for assuring that they are working correctly, and they have a system for assuring that support resources are aligned to the needs of business processes. Thus in the rest of this chapter we will focus on business process models; in subsequent chapters we will focus on business-wide process measurement, on process governance, and on alignment.

When we spoke earlier of the origins of process architectures in the writings of Rummler and Hammer, we emphasized that they weren't so much doing serious, enterprise-wide architectures as they were establishing a context for a process redesign project. Recent efforts to scale up from these initial approaches have resulted in serious problems, and today's approaches to business process architecture development work are quite different from those earlier efforts.

Figure 4.10 pictures a simple architecture like one we might have developed when we were trying to redesign the *deliver* packages process, which is pictured as one of the processes shown in the diagram. In essence, this diagram is simply an informal way of trying to identify some of the major processes that are likely to interact with the *deliver* packages process. If you develop a diagram like the one in Figure 4.10, and then decide to work on it to make it more detailed, you run into two major roadblocks.

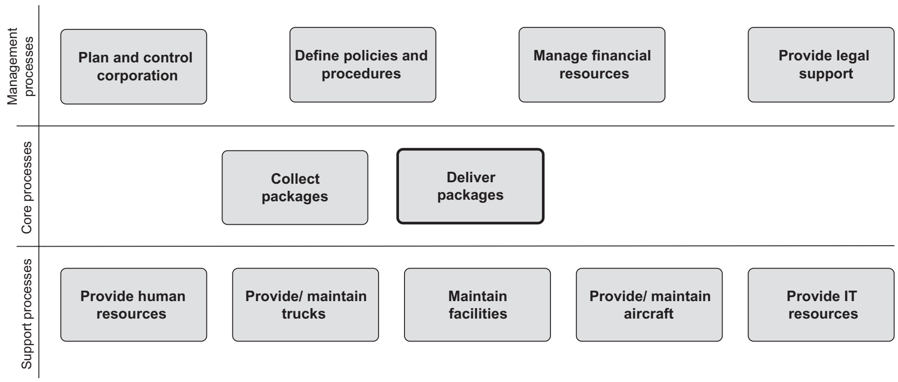

FIGURE 4.10

Simple process architecture.

First, the approach is almost invariably designed around a core process. It shows you the kinds of processes that might manage or support the *deliver* packages process, but it doesn't suggest what processes you might need to support other stakeholders. Let's consider two. The senior managers, owners, or shareholders are stakeholders with a major interest in the success of the value chain. They want financial information that will tell them what kind of return they are getting on their investment. Where are those processes shown in Figure 4.10? Similarly, where are the processes to support employees, outsourcers, government regulatory agencies, or community groups that may have an interest in this value chain? In other words, older architectures tended to model the core processes of the value chain, but don't do much with the various types of management and support processes.

One of the main reasons early process architects tended to avoid building comprehensive models is because they didn't know how to handle management and support processes. Process modelers had fallen into the habit of talking about processes as if they could always be neatly decomposed. One identified the value chain, and then subdivided it into its major processes. Then one divided those major processes into their subprocesses, and so on. It's a nice idea, and it works reasonably well if you stick with the core processes that make up the value chain, but it doesn't work very well when you focus on support processes. Consider Figure 4.11. Here we show several core processes with subprocesses. We also show three management processes, including *manage* financial data, and two support process, including *hire employees*. The minute you think of it, you realize that every process in the organization will at some time or another need to *hire employees*. Moreover, each of the major processes will be involved in the creation of annual budgets. In other words, when you starting trying to show the relationships between the core, management, and support processes and drill down two or three levels, you end up with diagrams

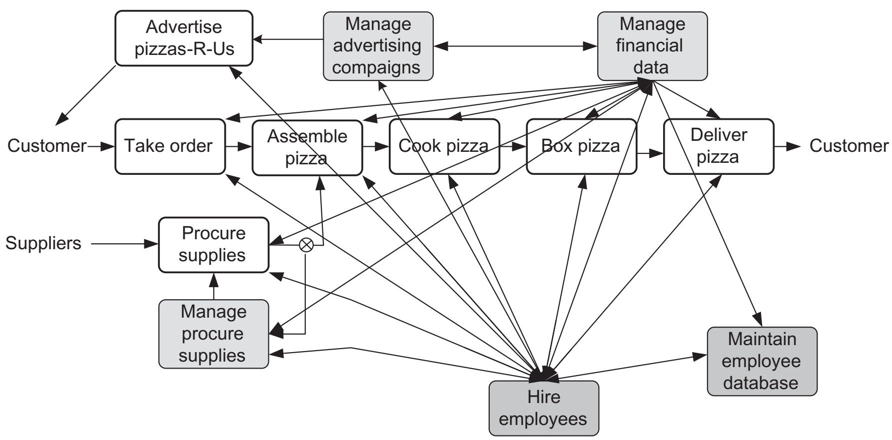

FIGURE 4.11

Set of core processes with just a few management and support processes.

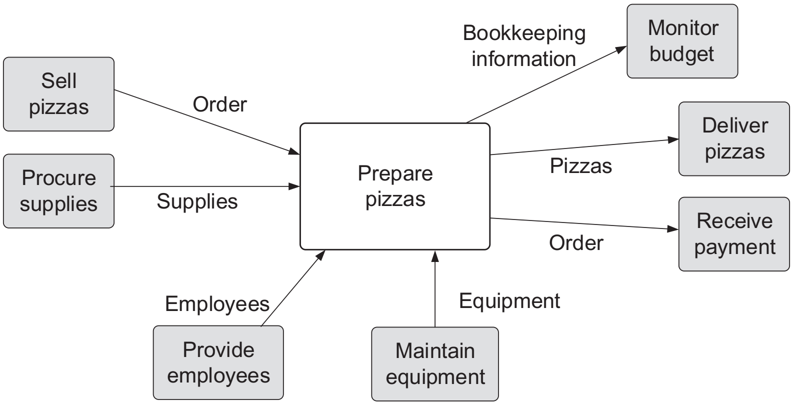

FIGURE 4.12

Third-level process shown with its relationships with other third level processes.

that are too complex to read or understand. The whole idea of an architecture was to improve the understanding of managers, and early architecture diagrams often did just the opposite.

One solution comes from the SCC as a result of their work on their supply chain framework. The SCC realized early on that it didn't make sense to decompose an architecture more than twice. In essence, they developed a new kind of diagram that pictures a Level 3 process and all the processes that interact with it. In hindsight, this is very like what BPTrends developed independently for a slightly different purpose and called a scope diagram. Figure 4.12 pictures a core process, *create pizza*, as a single box and then shows all the other core, management, and support processes it might interact with.

Creating a Business Process Architecture Model

This section will walk readers through the approach to developing a comprehensive business process architecture model that we recommend. This approach has been widely used in the actual development of architectures and roadmaps, and represents a practical approach to the problem. The approach assumes that a consultant (internal or external) is working with a team of managers who represent the entire organization. In essence, the consultant guides the team through a series of steps that results in both an architecture model, and then subsequently a roadmap to organization improvement.

Each step consists of two parts. The first step begins with a kickoff meeting in which the consultant explains how the entire effort will be organized, and lays out the work to be done during the first step. After the meeting the individual team members work together to accomplish the goals of the first step.

The second step begins with a second meeting. At this point the consultant reviews the results of the first round, and the team discusses and finalizes the work

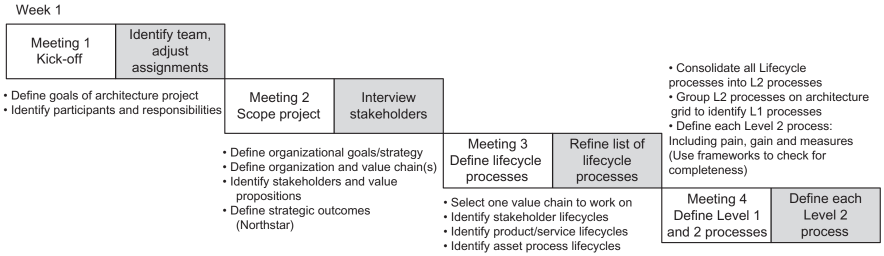

FIGURE 4.13

Overview of steps in an architecture development effort.

they have done. Then the consultant presents the work to be done next, providing any background concepts the team may require. Once the second meeting ends the team once again proceeds to undertake an assignment, and once the assignment is done a third meeting is scheduled (see Figure 4.13).

Figure 4.13 only pictures four meetings, the meetings necessary to define the architecture model. In a full-scale business process architecture effort, we would probably have other meetings to define a process measurement system, a process management system, discuss alignment, and define a roadmap to improve any broken processes that were identified in the course of developing the architectural model. We will ignore those subsequent steps for the moment, leaving them for subsequent chapters in this book.

The approach we describe usually takes from half a year to one year, depending on the size of the organization and the time the managers participating in the team can allocate to do architecture work. By breaking the effort up and allowing time for the team members to accomplish specific tasks a comprehensive architecture that adequately reflects the complexity of an actual organization can be developed by the managers of the organization.

We'll describe each step in the effort in a little more detail, beginning with the kickoff meeting and the formation of the team of managers. To simplify things, we refer to the steps by means of the names assigned to the meeting that begins each step.

Step 1. Kickoff Meeting

Any business process architecture effort begins by defining the boundary of the organization you are going to consider. The organization in scope may be a worldwide enterprise, or the architecture team may limit its efforts to one division within a larger organization. Once one has identified the scope of the organization, one asks how many value chains the organization supports. Determining the number of value chains an organization has can get complex, but the goal is to assure that you have a clean set of value chains when you are done, so that you can subsequently focus your analysis efforts on one value chain at a time. Figure 4.14 pictures Michelin, an organization that has two value chains: *produce and sell tires* and *produce and sell*

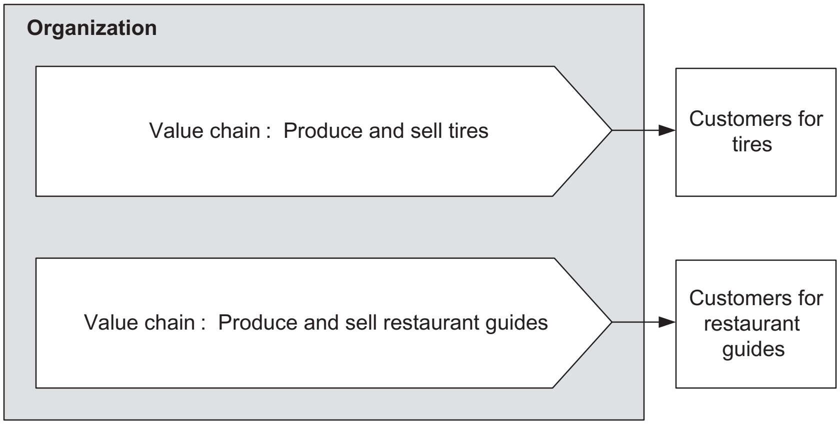

FIGURE 4.14

Organization with two value chains.

restaurant guides. The two lines of business are more or less independent and should be analyzed independently.

The organization wants a comprehensive business process architecture, so it is going to have to model the processes in both value chains. For our purposes, assume the team begins with an effort to model the processes in the *produce and sell tires* value chain.

Step 2. Scope the Project

Next, the team analyzes the stakeholders of the *produce and sell tires* value chain. Stakeholders in this case can refer to either internal or external groups that have an interest in whether or not the value chain succeeds or fails. We have already identified one—the customers for the tires. There are, however, others. For example, there is the management of the organization. There are the shareholders of the organization. There are government agencies that regulate and tax organizations, and there are partners who sell supplies for the production and sale of tires, or who help with marketing, distribution, or sale of the tires. There are also the employees who depend on the value chain for jobs. Figure 4.15 illustrates some of the stakeholders that the architecture team identified for the *produce and sell tires* value chain.

To succeed, the *produce and sell tires* value chain has to support each of its stakeholders. Obviously, the company won't succeed if it fails to attract customers, but it will go bankrupt just as surely if it fails to pay taxes, or fails to retain the employees it needs for its successful operation. The organization needs measures of the success achieved by each stakeholder. More to the point, there must be processes to support each of the stakeholders. Thus, for example, the organization must have a process for managing its stock, for providing reports to shareholders, and for dealing with shareholder problems. Similarly, the organization must have processes for hiring new

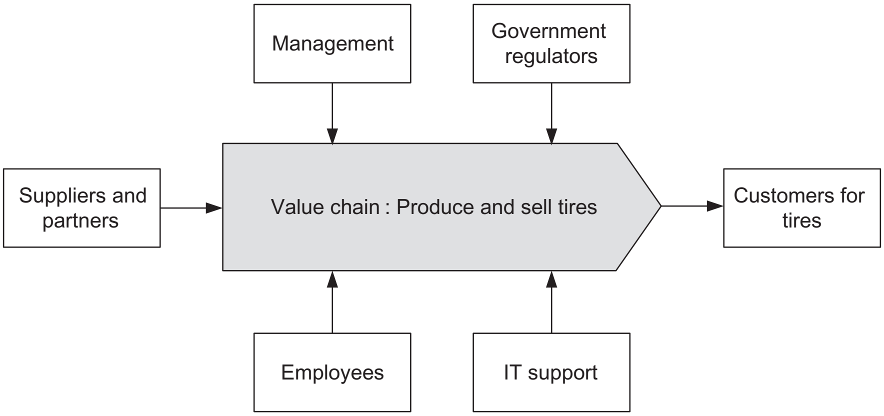

FIGURE 4.15

Stakeholders in the *produce and sell tires* value chain.

employees, for paying existing employees, for dealing with employee problems, and for managing pensions for retired employees.

Historically, process architecture teams have tended to focus almost exclusively on the core processes that generate products and services for customers. Developing a comprehensive business process architecture requires a broader perspective.

Step 3. Define Life Cycle Processes

To keep things simple, imagine that there is one major business process in the organization that is designed to support each stakeholder. Figure 4.16 pictures the situation we are imagining. In essence, each of the loops (the two-headed arrows) shown in Figure 4.16 is a value stream (as the term is defined by the Lean Enterprise Institute—a process that begins with a request by an external party and ends when the request is satisfied). In Figure 4.16 we keep it simple and assume that each external stakeholder interacts with the value chain in one way.

In reality, it is more common for a stakeholder to interact in multiple ways. Looking just at the customer-value chain interaction between a bank customer and a bank, for example, we arrive at three major value streams. One involves a request on the part of a customer to open a new bank account. A second involves a request by the customer for a specific service—say, cashing a check on his or her new account. A third possible interaction arises when the customer asks for a service that the bank does not currently offer. That request might trigger a new service design process that would eventually generate a new bank service offering. All three of these value streams are diagrammed at a high level in Figure 4.17 and at a more detailed level in Figure 4.18.

We are picturing the many processes required to respond to customer requests. We will need to do this same kind of analysis for each of the other stakeholders. Management, for example, needs reports so it in turn can generate reports for banks

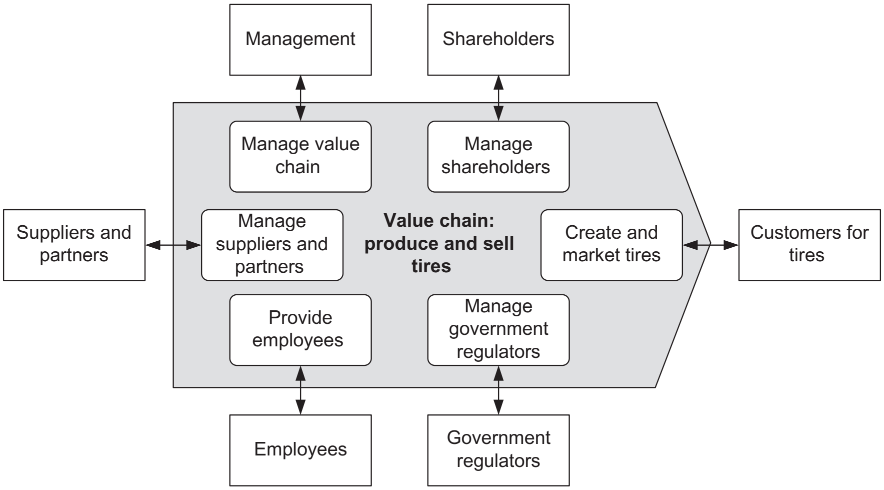

FIGURE 4.16

Processes that provide products and services for value chain stakeholders.

and stockholders, or so it can initiate changes in budgets or make decisions about targets for future months. Employees need to be hired, need ongoing support (salaries, health care, pensions), and some may need disciplinary action or even need to be fired. In essence, we need to define all the processes required to respond to all the requests that stakeholders might make of the value chain. This is not a trivial process and will require quite a bit of thought on the part of the team working on architecture modeling.

Assume that we term the large processes that interact with the stakeholders Level 1 processes and that we call the subprocesses identified in Figure 4.18 Level 2 processes. Without going into more detail, you can see that our initial analysis of a value chain is going to generate a large number of processes, some core and some managerial or supporting in nature. Processes designed to provide shareholders with financial statements will be managerial in nature, whereas processes to hire and pension employees will be support processes.

We have pictured the processes rather neatly in Figure 4.19. In fact, as the team will proceed to generate hundreds of processes it's best to do this on a whiteboard, or on a large sheet of paper with Post-it notes that can be easily modified and moved about. One key point at this stage is that all the processes are tentative. We are not interested yet in determining the exact set of processes, but just in assuring that we have identified all the Level 2 processes that will be required.

Step 4. Organizing and Consolidating the Level 2 Processes

Using the approach we have described in a bank analysis we usually arrive at some 100 Level 2 processes that we then need to organize more effectively. Generating value streams for each stakeholder has the advantage of generating a rather comprehensive

Business process scorecard			
Project:		Analyst:	
Organization-in-scope		Process in scope:	
Stakeholder	**What does the stakeholder give to or get from the process?**	**Why does the stakeholder care if the process works or not?**	**What are the KPIs and targets for the stakeholder?**
Customers for tires	Customer buys tires for car	Customer expects a tire with high quality characteristics that will perform well and last a long time	Customer complaints Customer returns Additional customer purchases
Management	Management provides capital and direction and earns income from conducting business in a profitable manner	Management depends on process for its livelihood and reputation	Income, profit, ROI No complaints Good reviews
Suppliers and partners	Generates income by providing goods or services to the process	If the process were to fail, or the process managers shift suppliers, the supplier would lose income	All goods and services delivered on time and with in spec. Satisfactory reports of interactions with suppliers No complaints
etc			

FIGURE 4.17

Multiple value streams initiated by a single type of stakeholder.

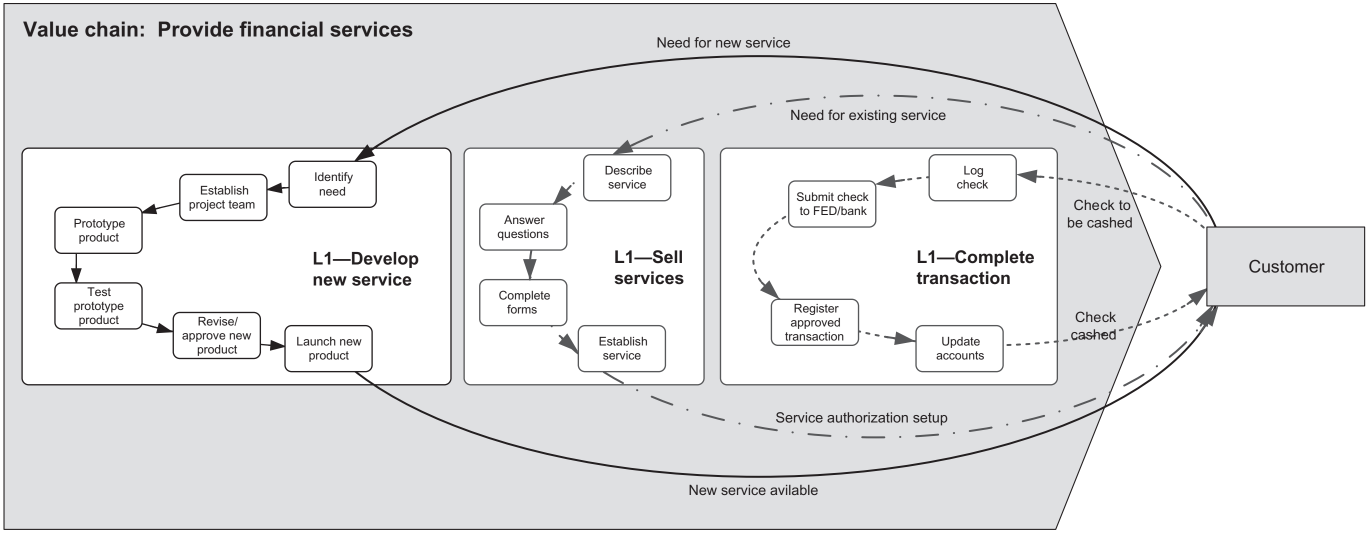

FIGURE 4.18

Detailed look at multiple value streams initiated by a single type of stakeholder.

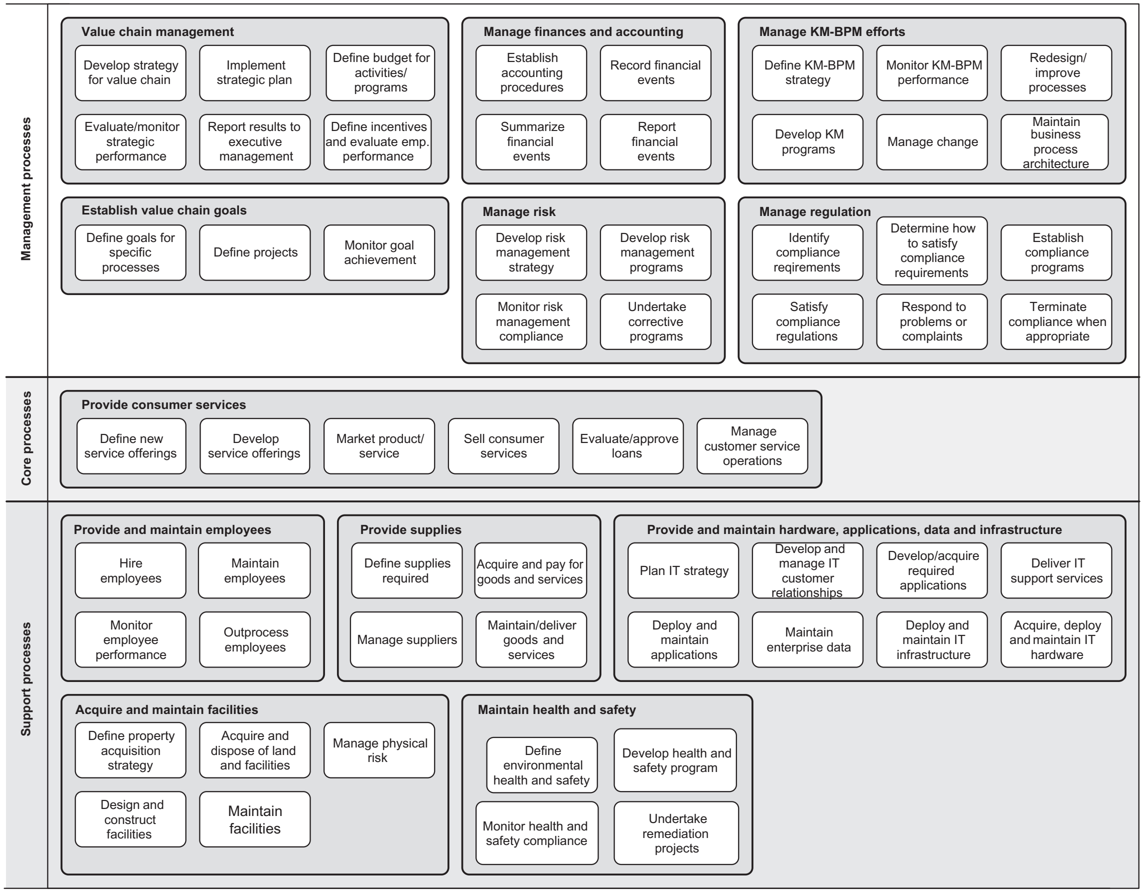

FIGURE 4.19

Comprehensive list of Level 1 and Level 2 processes for an organization.

list of processes. It has the disadvantage that the same process may show up in more than one value stream, and the same process may be given different names, depending on which group uses the process. Thus, after the initial effort is complete and a comprehensive list of processes has been generated, the team must then review all processes from a given value chain and organize them into a consistent list of Level 1 and Level 2 processes (see Figure 4.19).

The team will have a certain amount of trouble deciding what processes to combine. Some organizations tend toward more processes, and others tend to try to keep their Level 1 and Level 2 processes at a minimum. There is no firm rule, but it is important to be consistent and keep all the processes you define at more or less the same level of granularity. Figure 4.19 shows the Level 1 (gray) and Level 2 processes that one organization came up with. One key thing to note is that this architecture model is more or less complete, in the sense that is has a full complement of management and support processes, in addition to its core processes. Moreover, although we don't show it, in the process of arriving at the solution shown in Figure 4.19 most organizations will already have several Level 3 processes in each of the Level 2 rectangles—processes that they originally arrived at when they did their value stream analysis, but then decided on reflection to combine into some more generic Level 2 process. The other thing to note is that there is no effort to connect any of the processes together into flow patterns. It's true that the core processes are arranged more or less in the order of flow, but no effort is made to show how any given support or management process connects to any core process, or to each other. Linking lower level processes into flow networks is important for process redesign and improvement, but it's just a distraction when creating higher level architecture models.

As we have already suggested, we create a business process architecture to serve as a management tool, just as we create a table of accounts to serve as a management tool. Managers use process models in part to understand how the organization works, but primarily to serve as a way of monitoring the success or failure of major processes in their organization, and thus as a way of identifying processes that need to be improved.

That said, the current focus on business process architecture goes beyond simple process improvement efforts and supports monitoring, process management strategies, and a variety of efforts to outsource or link with partners in processes that extend across multiple organizations. Until recently, the approach to architecture was relatively primitive, but developments in the last 5–10 years promise to transform this branch of business process management (BPM) and make it much more useful to organizations that are trying to become process centric.

Defining an Architecture Using a Framework

So far we have discussed how one might develop a comprehensive business process architecture from scratch. In fact, many organizations rely on published frameworks to provide the basic structure for their architectural efforts. This is especially popular if the industry in which the company operates has a standard framework, or if the organization is interested in creating a framework for a special purpose. At this point let's reconsider process frameworks in a little more detail.

The Supply Chain Council's SCOR Framework

The SCC (now APICS) was established as a nonprofit consortium in 1996. Today, APICS (SCC) is a worldwide organization with over 900 members. APICS holds meetings that allow companies to gather together to discuss supply chain problems and opportunities. In addition, it continues to develop or refine its standard supply chain framework or reference model.

Before considering SCOR itself, let's consider why the SCC membership was motivated to develop the framework in the first place. Increasingly, companies are creating supply chain systems that cross company boundaries. It's not uncommon for 10 or 20 companies to sit down to figure out how their companies will work together to move materials to manufacturers and then to distributors and, ultimately, to customers. If each team had to begin by trying to straighten out what terms they used to describe what processes the effort would take a lot more time. Instead, the SCC decided to define a high-level set of supply chain process names that everyone could use. Each company could continue to use whatever particular process names they choose, but in conversations with the other companies each could use the standard vocabulary defined by SCOR. Later the SCOR model was extended so that it not only defines core processes, but also defines management and support processes and provides precisely defined performance measures for each process. Using the performance information companies can define who will pass what to whom and when in an unambiguous manner. Having established the system the SCC members then proceeded to provide performance information to an external benchmarking organization that in turn provides general information in return. Thus, an individual company can determine how its delivery processes compare with other members of APICS, or more specifically with others in the same industry. Thus, SCOR began as an effort to facilitate efficient communication and modeling and evolved into a general methodology that can be used to quickly define a supply chain architecture complete with benchmarked measures.

Let's begin with a more detailed look at SCOR architecture. The SCC speaks of SCOR as being comprised of three levels. They ignore the fact that the supply chain is only one of the major business processes that make up the entire value chain. To clarify this we will always refer to the value chain as Level 0. Then we will refer to the supply chain as a Level 1 process. To make things even more complex, SCOR subdivided the supply chain into three "levels," but in fact one of the levels is not a decomposition of the higher level and instead requires the modeler to define the higher level process in terms of one of three variations. Either the Level 1 source process is concerned with stocked products or it is concerned with made-to-order products, or with engineered-to-order products. To simplify things we will consistently speak

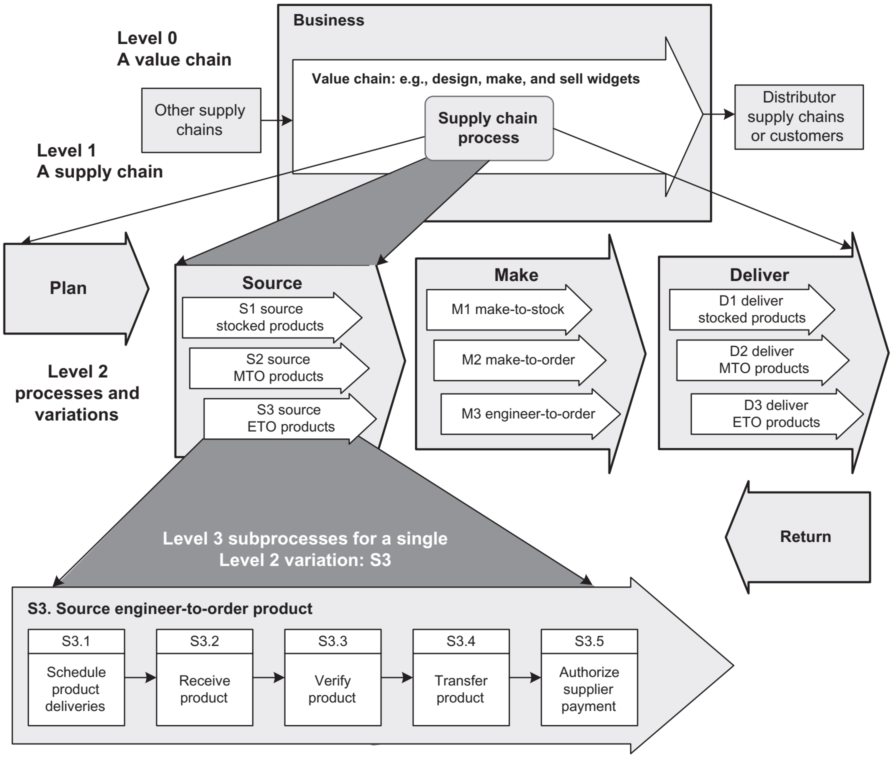

FIGURE 4.20

Three levels of SCOR architecture.

of SCOR as having three levels. Level 1 is the supply chain. Level 2 consists of the high-level processes that make up a supply chain, including *source*, *make*, *deliver*, and *return*. Plan is an additional SCOR process that describes management planning. These Level 2 processes are first defined, then their variation is specified, and finally they are decomposed into a set of Level 3 subprocesses as pictured in Figure 4.20.

The SCOR manual defines each Level 2 and Level 3 subprocess and indicates what planning and support processes are typically linked to each process or subprocess. The SCC does not define a fourth level, leaving the specification of Level 4 activities to individual companies. In other words, SCOR defines a supply chain architecture and all of the high-level processes and leaves the technical implementation of Level 3 processes to individual members.

Developing a Supply Chain Architecture With a SCOR

Using SCOR a company can quickly characterize its supply chain architecture. Figure 4.21 illustrates a map that SCOR architects usually draw to show where materials originate, how they are moved to assembly points, and then distributed to customers.

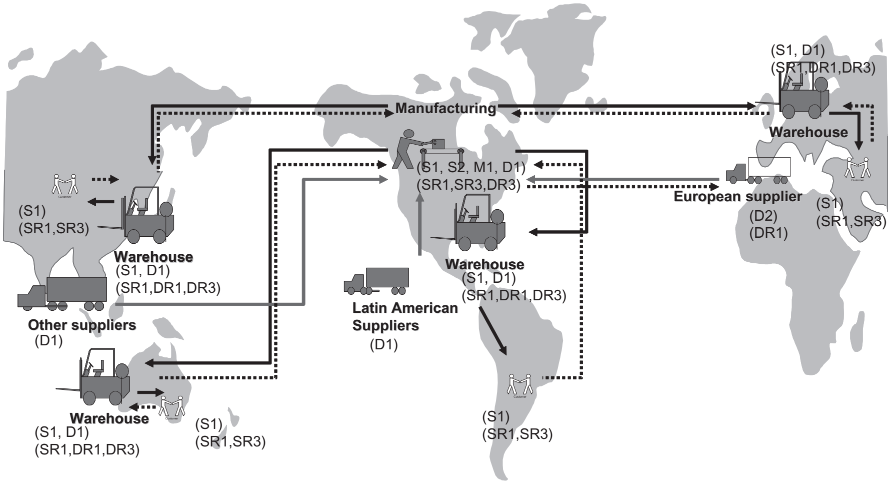

FIGURE 4.21

As-Is geography map of a company's supply chain.

Once the supply chain is described by means of a map, it is then redrawn using the SCOR diagramming convention illustrated in Figure 4.22. The SCC refers to the diagram as a thread diagram. In this diagram each Level 2 process in the supply chain is illustrated by a small arrowhead. The bold lines separate companies and the dashed line separates divisions within a company. Note that two suppliers are feeding the Alpha company's supply chain. The letters indicate that a process is either a *source* (S) process, a *make* (M) process, or a *deliver* (D) process. The numbers indicate the variation. Thus an S1 is a *source* process that relies on continuously stocked products, whereas an M2 process is a *make* process that relies on providing products that are made-to-order. (Refer to Figure 4.4 for the designations.) A thread diagram

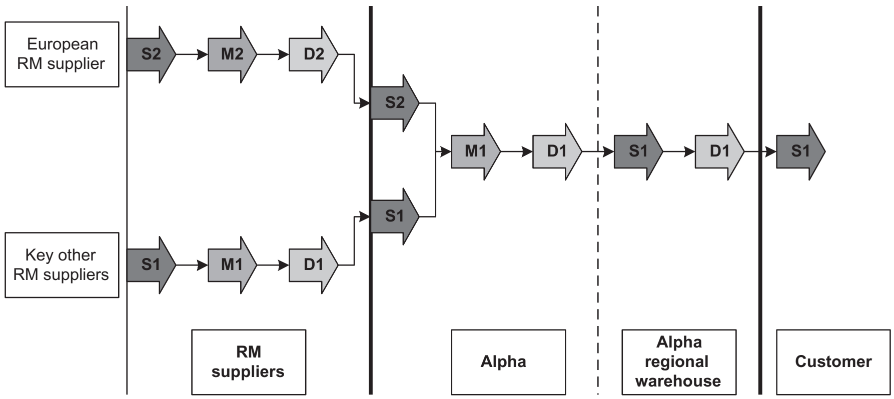

FIGURE 4.22

SCOR thread diagram of a simple supply chain process.

can be quite a bit more complex if the supply chain involves multiple columns of suppliers and columns of distributors. Similarly, in more complete diagrams the *plan* processes are also entered. In effect, as Plan refers to a process management effort, for every core process shown on the thread diagram there is also a *plan* process.

The SCC provides members with a Reference Manual that defines every supply chain process and subprocess. In addition, the manual describes performance measures that are appropriate to each process at each level. The SCC divides all performance measures into five general categories that are then clustered into either external or customer facing metrics or internal facing metrics. Figure 4.23 provides a high-level overview of the measures that are defined for the supply chain as a whole (the Level 1 process). We won't go into measures any further here, but suffice to say that one can use SCOR metrics to quickly generate an interlocking list of metrics for an entire supply chain architecture.

Several organizations that track benchmarks are working with the SCC and can provide generic benchmarks for SCOR measures for specific industries. If a company wants specific benchmark data it needs to contract with one of the benchmarking groups.

In Figure 4.24 we illustrate what SCOR refers to as a SCORcard. It shows the performance attributes, a set of historical data, and the benchmark data for a hypothetical company's supply chain. In the right column the team has made some "guestimates" about what kind of value Alpha might achieve, assuming it could move its supply chain process closer to the average for its industry. SCOR terms the

	Performance attribute	Performance attribute definition	Level 1 metric
Customer facing attributes	Supply chain delivery reliability	The performance of the supply chain in delivering: the correct product, to the correct place, at the correct time, in the correct condition and packaging, in the correct quantity, with the correct documentation, to the correct customer.	Delivery performance
			Fill rates
			Perfect order fulfillment
	Supply chain responsiveness	The velocity at which a supply chain provides products to the customer.	Order fulfillment lead times
	Supply chain flexibility	The agility of a supply chain in responding to marketplace changes to gain or maintain competitive advantage.	Supply chain response time
			Production flexibility
Internal facing attributes	Supply chain costs	The costs associated with operating the supply chain.	Cost of goods sold
			Total supply chain management costs
			Value-added productivity
			Warranty / returns processing costs
	Supply chain asset management efficiency	The effectiveness of an organization in managing assets to support demand satisfaction. This includes the management of all assets: fixed and working capital.	Cash-to-cash cycle time
			Inventory days of supply
			Asset turns

FIGURE 4.23

SCOR performance attributes and Level 1 metrics.

Supply chain SCORcard				Performance vs competitive population			
	Overview metrics	SCOR level 1 metrics	Actual	Parity	Advantage	Superior	Value from improvements
External	Supply chain reliability	Delivery performance to commit date	50%	85%	90%	95%	
		Fill rates	63%	94%	96%	98%	
		Perfect order fulfillment	0%	80%	85%	90%	$30M revenue
	Responsiveness	Order fulfillment lead times	35 days	7 days	5 days	3 days	$30M revenue
	Flexibility	Supply chain response time	97 days	82 days	55 days	13 days	Key enabler to cost and asset improvements
		Production flexibility	45 days	30 days	25 days	20 days	
Internal	Cost	Total SCM management cost	19%	13%	8%	3%	$30M indirect cost
		Warranty cost	NA	NA	NA	NA	NA
		Value added employee productivity	NA	$156K	$306K	$460K	NA
	Assets	Inventory days of supply	119 days	55 days	38 days	22 days	NA
		Cash-to-cash cycle time	196 days	80 days	46 days	28 days	$7M capital charge
		Net asset turns (working capital)	2.2 turns	8 turns	12 turns	19 turns	NA

FIGURE 4.24

SCORcard with actual and benchmark data, and some guesses about the value that might be achieved by redesigning the supply chain being analyzed.

comparison of the company's actual, historical performance with the benchmarks for the company's industry as a gap analysis, and uses it to determine if redesign or improvements in the As-Is supply chain will really justify an investment.

Once the SCOR team has examined the Level 1 and in some cases the Level 2 As-Is historical data, it is in a position to decide if the supply chain should be changed. In effect, it is now ready to review the organization's existing approach to its supply chain, and if necessary define a new supply chain strategy and set targets, priorities, and a budget for any redesign effort. The use of the SCORcard provides a nice illustration of the power of the architecture approach. Once a company has a complete overview of all its processes and solid performance data, it is positioned to consider how each of the processes are performing, compare them with benchmarks, and then decide which possible intervention would produce the most significant result. This illustrates the sense in which an architecture is a tool for management.

The Extension of a SCOR

The next part of the SCOR story is closely associated with Joseph Francis (a former Executive Director of the SCC) and the Hewlett-Packard-Compaq merger that took place in September of 2001. The previous 2 years had witnessed a major slump in sales that had forced many IT companies to reevaluate their strategies. The proposed merger of two leading IT companies—the largest IT merger to date—represented a major strategic initiative on the part of the management teams at both companies to change the overall dynamics of the IT market.

HP was a leading player in mid-range servers, in PCs and laptops, and in printers. It was also a leader in integration services and outsourcing, and had a worldwide reputation for cutting edge technology. At the same time, however, HP wasn't large enough to compete for the largest service contracts that typically went to larger competitors like IBM. Moreover, HP's marketing prowess had declined in recent years. In 2001, for example, HP had some 6000 people in marketing, whereas similar-size competitors managed with one-third as many. Compaq was even stronger than HP in PC and laptop sales, but lacked HP's strength in all other areas. Compaq had acquired Tandem Computers and Digital Equipment in the late 1990s in an effort to diversify, but had never managed to utilize Tandem or Digital's strengths in mid-range computers, technology, or consulting to achieve the market presence it had hoped to obtain when it made those acquisitions. On the other hand, Compaq was known for its aggressive marketing capabilities.

The merger of the two companies would result in a significantly larger company. Together, HP and Compaq would be in a position to dominate the market for PC, laptop, server, and printer sales. At the same time the combined company would be nearly as large as IBM and would thus be well positioned to compete on an equal footing for the largest service and outsourcing contracts. The new company would also be in a position to require suppliers to offer it the largest possible discounts. Moreover, since there was considerable overlap in the PC area the two companies hoped to squeeze out some $2.5 billion in annual savings while simultaneously creating a leaner, more aggressive organization.

From the beginning the proposed merger was controversial. Arguments about the wisdom of the merger, and the proxy fight that followed, were extensively reported on in the popular press. Ultimately, the actual merger actually went more smoothly than most anticipated, and resulted in greater savings than those who planned the merger had hoped for. As even the merger's strongest opponents admitted the planning that preceded the merger was excellent.

What is of interest to us is the planning process that helped make the merger successful. Specifically, we want to consider the activities of the merger planning team that planned for the integration of the HP-Compaq supply chain processes. As soon as the merger was formally announced a new organization was set up to plan for the merger. This merger organization ultimately included some 1000 employees drawn from the two companies. The employees met in what was referred to as a clean room environment. In effect, they were separated from the day-to-day work of both HP and Compaq, placed in an isolated setting, provided detailed information about both companies, and asked to develop a merger plan.

The merger organization was headed by an executive committee that made high-level strategic decisions and, ultimately, approved all the detailed recommendations of the more specialized teams. Reporting to the executive committee were eight teams that focused on specific areas of concern. There were teams for *IT infrastructure*, *supply chain*, *sales/orders*, *product design*, *communications/marketing*, *finance*, *HR*, and *services/support*.

Some of the teams lacked any overarching framework and had to create a new, common vocabulary and a standard way of identifying existing processes. Luckily, HP and Compaq were both members of the SCC and were familiar with SCOR. The HP-Compaq supply chain team realized that they could use SCOR to greatly simplify their task. SCOR provided a standard approach that they could use to rapidly characterize and measure the supply chain processes at both HP and Compaq.

By agreeing in advance to map both companies' processes to the SCOR model and to use SCOR's standard vocabulary and measures the HP-Compaq team was able to accomplish in a month what might otherwise have taken many months.

SCOR's ease of use was critical for the work undertaken by the supply chain-IT team during the merger. SCOR made it possible for the team to quickly analyze all the HP and Compaq supply chains for all regions and product lines. This analysis in turn made it possible for the supply chain–IT team to accurately compare a Compaq process with an HP process for similar product lines to determine what each process actually accomplished.

The HP-Compaq supply chain team was able to define all their supply chains quickly, by simply relying on SCOR's Level 1 definitions. In effect, all supply chains were quickly divided into *source* processes, *make* processes, and *deliver* processes, as well as some additional planning and enabling processes. Once this was done high-level software applications that supported each of these processes were identified.

SCOR provides a well-defined set of measures for each of the Level 1 processes. Those measures are tied to established financial measures that both companies have tracked for years. Thus, in most cases one simply used SCOR Level 1 measures to compare two regional lines to determine which was the more efficient and cost-effective. If one line was clearly more efficient than the other then the supply chain–IT team tended to simply select the applications that supported the more efficient process.

Those familiar with how technical people can disagree about the virtues of competing software applications can easily imagine that the supply chain–IT team could have become an arena for intense arguments among the HP and Compaq advocates of alternative software applications. The supply chain–IT team knew that if they allowed the discussion to become focused on specific technical features they would never accomplish their assignment. Moreover, a technical discussion wouldn't assure that the application chosen would be aligned with corporate goals. Instead, the team knew that it was important that their work focused on the value that the various applications delivered to the company. In effect, the team decided to select those applications that supported the most efficient processes, without regard to which company currently supported the application, or which departments were involved.

Some of these measures focus on external results and some focus on internal efficiencies. In each case the SCC has defined precise definitions for the measures. No organization would want to apply all these measures to a given SCOR process or subprocess. Instead, the SCC has a methodology that helps practitioners align the measures they consider with the strategic goals the company is trying to achieve with a given supply chain process. Consider the goal of a given product line. If the company wanted to compete in the market for that product line as the low-cost provider, it would focus on keeping a minimal amount of inventory, since low inventory is one of the ways to keep costs down. On the other hand, if the company that was committed to service and wanted to assure that customers could always get what they wanted, it would need to accept higher inventory costs and would focus instead on satisfying customer requests. Different strategies require different measures. The supply chain team made most of the decisions about marketing strategies for the combined product lines and the supply chain–IT team then selected appropriate measures and used them to compare how the existing HP and Compaq product lines performed.

In a few cases two competing regional lines would appear to be equally efficient and effective when analyzed with Level 1 measures. In those cases the supply chain–IT team would expand their effort and model the processes to SCOR Level 2 or even in a very few cases to Level 3.

About 20% of the total time used by the supply chain team was used in modeling processes, measuring them, applying criteria, and making judgments as to which applications to save and which to discard.

Once the supply chain team had identified product lines to maintain, modeled the processes, and then evaluated and selected applications to maintain it was possible to step back from the specific supply chain processes being evaluated and to identify a generic supply chain architecture for the combined company. In effect, this architecture identified common supply processes derived from SCOR and common applications that the merged company could eventually standardize on worldwide. The applications identified were not new applications that the merged company would acquire, but applications already being used with successful product lines that the company would standardize on and migrate to in order to minimize the number of applications the new HP would need to support.

At the end of this phase the supply chain–IT team had identified all of the product lines that were to be supported in the merged company, had identified all of the applications that were to be maintained and those to be dropped, and identified a set of overall architectural standards that the company would move toward as soon as possible.

Other HP-Compaq teams made their recommendations, but the supply chain team's recommendations stood out because they were based on an analysis of the processes involved and hard numbers on the performance of the processes. The supply chain team's recommendations to use specific software applications were justified by the performance of the processes that had used those applications. The business logic behind the supply chain team's work led to the appointment of the team's leader, Joe Francis, to the head of the new HP Business Process Improvement Program.

Another Approach

Another approach to putting in place a complete value chain framework is provided by the TeleManagement Forum, a consortium of telecom companies. Their framework is highly tailored to the needs of telecom companies. Thus, it can't be used by nontelecoms, but it does provide a comprehensive approach for telecom companies.

One group within the TeleManagement Forum has spent several years developing process architecture for telecom companies. It is assumed that no specific company will have exactly the same processes identified by the TeleManagement Forum, and that they will probably use different names for the various processes. Thus this is a reference architecture rather than an architecture of a specific business. It is assumed as time passes that most members will move toward this process architecture and that during the same period vendors will tailor products to implement many of the processes defined by the model.

The architecture we describe is the third iteration that the TeleManagement Forum has developed. This latest iteration, called the eBusiness Telecom Operations Map (eTOM), is based on earlier work that only sought to define the operations processes within telecom companies. As companies began to implement e-business applications they discovered that processes in general and enterprise management had to be added to the architecture. One of the major advantages of e-business systems is that they integrate management and operations, and it's important that everyone has a clear overview of all the processes if they are to see how integration might occur.

Figure 4.25 shows a version of the eTOM framework rearranged so that it matches the format that we use in this book. In effect, we rotated the basic eTOM diagram 90 degrees to the right. The *customer* was moved to the right side of the diagram so that *processes* now flow from left to right and functional units flow down, as organization charts typically do.

Figure 4.25 provides an idea of how a telecommunications company is organized. In essence, a telecom sells time on its network to customers. Since the time is sold and monitored by means of computers that track phone access, *service* and *resource* are important functions. Since almost all long-distance phone calls cross multiple networks, arrangements with other telecom companies (partners) are very important. We suspect that actual phone companies might subdivide their departments somewhat differently, placing marketing and service in separate departments. But, remember that most phone sales and service requests come in through a common call center, so this high-level grouping works reasonably well. In any case Figure 4.25 provides an idea of how a group of telecom managers felt they could represent their organizations.

Figure 4.25 would provide a telecom process architecture committee with an overview of the company. Every business process architecture committee needs something like these figures if they are to have a standard way to describe their company's processes and identify processes that require changes when new strategies and goals are announced. In fact, a process architecture committee would probably want something a bit more detailed.

If you are not a telecom executive you might not be familiar with some of the terms used to describe the various subprocesses. The key thing is that this business process architecture illustrates a framework that is detailed enough that a telecom process architecture committee that was familiar with its own organization could be reasonably efficient in determining just which processes or subprocesses would need to be changed to achieve specific changes in company strategy and goals. One could easily imagine an accompanying document that provided short written descriptions of each of the subprocesses.

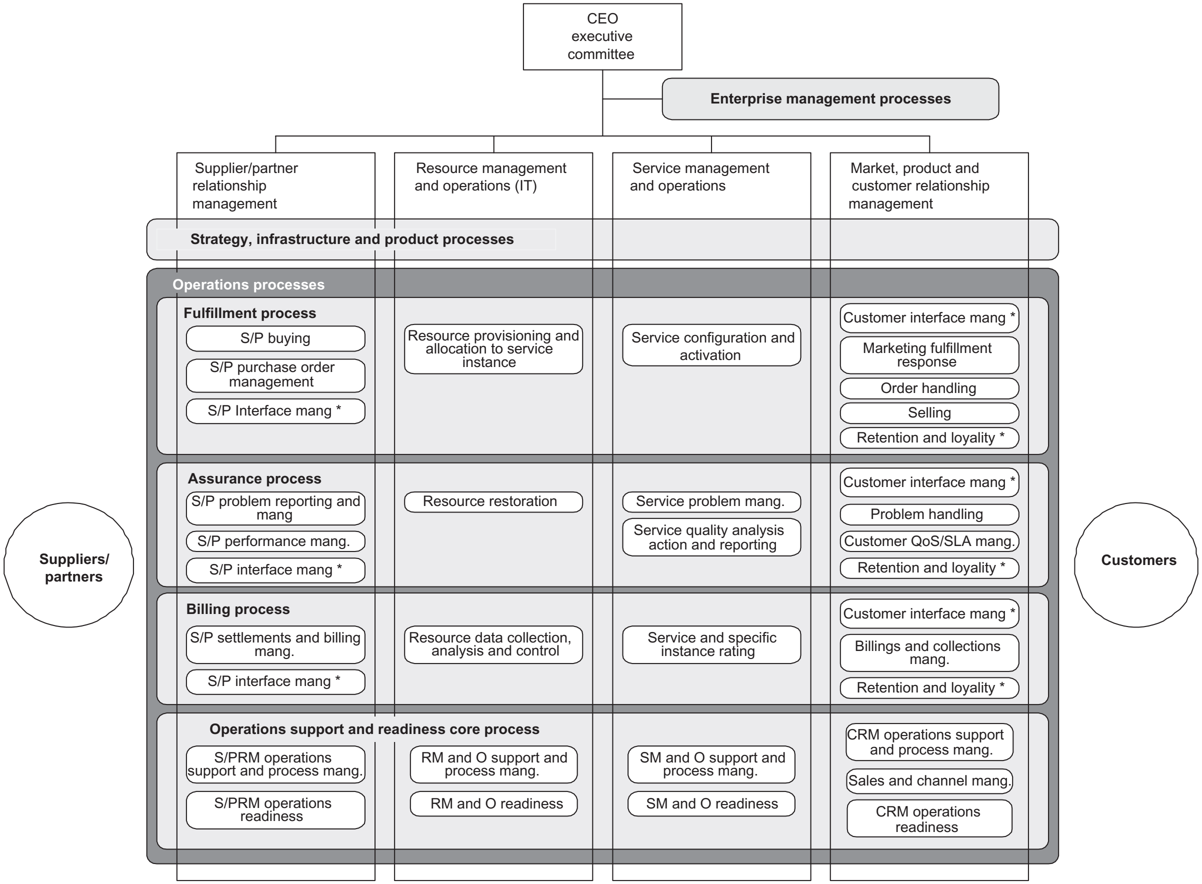

FIGURE 4.25

TeleManagement Forum's eTOM reference architecture.

Figure 4.25 raises two issues that we will consider in more detail later in this book. First, it suggests the possibility of a matrix management system. Someone is usually responsible for complete processes like *fulfillment*. That's the person who thinks about how all the subprocesses in *fulfillment* work together to deliver services to the customer in a smooth and efficient manner. Someone else is probably responsible for *service management and operations*. The employees that work on the *service configuration and activation* subprocess probably report to the service management and operations manager. Thus, one manager works to assure that the complete process works efficiently. Another is responsible for employees that perform some of the subprocesses within the *fulfillment* process, and within other processes as well.

The other issue that is obvious when we begin to discuss a framework like eTOM is how many times the word *process* appears. When the chart is as simple as the one in Figure 4.25 we can live with processes, groups of processes, and subprocesses. We have already seen how the ultimate process is a value chain. Most organizations only have a few value chains. We suspect that the entire eTOM framework really only pictures one value chain: *deliver telecommunication services*.

We have hardly considered all the existing architecture frameworks available. The US government has one, and several government agencies (Australia, Canada, Sweden, and cities in Denmark) have others. The insurance industry consortium, ACORD, has its own reference architecture, and there are probably others we haven't heard of yet. The point, however, is that companies undertaking the development of a business process architecture are today in a position to greatly accelerate the process by beginning with one of the available frameworks and then tailoring it to their specific needs.

Summary

A business process architecture is a management tool. Once it is defined and then populated with up-to-date data, it can be used like other databases to answer ad hoc questions that executives need to be answered. It can be used to support those engaged in developing corporate strategies, and it can be used by a BPM group to identify processes that aren't meeting their goals and that need to be redesigned. The information placed in the business process architecture database will depend on how the company uses it. Most companies that have created architectures find that they make it easier for managers to conceptualize their organizations in terms of processes, and this leads to requests for more and more information about the processes that the company supports.

We began with an overview of how one goes about developing a business process architecture. We saw that one could use a process description to organize the collection and alignment of data about the processes. Then, we considered how an actual process architecture development team can use a process framework like SCOR or eTOM to speed the architectural development process. The frameworks don't provide you with a management strategy, or suggest specific alignments, but they provide a systematic decomposition of your high-level processes and suggest performance measures that can be used for all the processes in your architecture. You can use a framework to quickly fill out worksheets or populate a business process database and then tailor it and begin aligning resource information. Thus, in a very short time, your company can begin to benefit from the kind of analysis and project prioritization that you can derive from having an effective process architecture.

Notes and References

The organization diagram figures derive from figures originally developed by Geary Rummler.

The discussion of APICS (SCC)'s SCOR methodology and some of the figures came from the SCC's beginning workshop on SCOR or from other SCC publications. More information on the SCC is available at http://www.apics.org/overview/about-apics-scc.

A good general overview of the SCOR methodology is available at http://www.bptrends.com (search for Harmon, *An Introduction to the Supply Chain Council's SCOR Methodology*, January 2003).

Bolstorff, Peter, and Robert Rosenbaum, *Supply Chain Excellence: A Handbook for Dramatic Improvement Using the SCOR Model*, AMACOM, 2003. A good book that presents a specific approach for implementing SCOR at a company.

I am particularly indebted to Joseph Francis for his comments and insights on SCOR and the evolution of SCOR+ at Hewlett-Packard. Joe was, for a while, the BPM manager at HP and is currently the CTO of the SCC. He also runs his own consulting company and helps companies with framework issues. More information is available at http://www.pcor.com.

The John Zachman framework shown in Figure 4.6 was modified after a figure that appeared in Zachman, John, "A Framework for Information System Architecture," *IBM Systems Journal*, Vol. 26, No. 3, 1987. The latest version of Zachman's framework is available at http://www.zachman.com.

Information about The Open Group and TOGAF is available at http://www.opengroup.org/togaf.

Information about the FEAF is available at http://www.whitehouse.gov/omb/e-gov/fea.

Information about the Business Architecture Guild and their BIZBOK model is available at http://www.businessarchitectureguild.org.

My insight into Lean and, in particular, the use of the value stream concept owes a great deal to conversations I have had with Steven Bell and the team he assembled to write *Run*, *Grow*, *Transform*: *Integrating Business and Lean IT* (Steven Bell, Ed., CRC Press, 2013), which I strongly recommend to anyone interested to applying Lean concepts in the IT area.

Information on the ACORD insurance Reference Architecture is available at http://www.acord.org/stamdards/architecture/reference-architecture.

CHAPTER

Measuring process performance

5

This chapter focuses on organization-wide process performance measurement. Every organization keeps track of its performance in some manner. Some have very elaborate performance measurement systems that allow them to determine what is taking place in real time, while most track a wide variety of measures and review them at the end of each week or month. It is widely held that performance information is a key differentiator and that organizations that can obtain and use information about their markets and their processes in a timely manner can perform better. Thus it is not surprising that companies are investing large amounts of money in developing new and more elaborate performance-monitoring systems.

Historically, there was a rather large disconnect between what executives were concerned with and what operational managers focused on. As a generalization, executives were interested in financial reports and in the performance of the company's stock. Everyone agrees that these are key performance indicators (KPIs), but problems arise when the organization tries to translate these measures into more concrete measures that can be applied to marketing, manufacturing, or accounting. Operational managers are more focused on the efficiency and effectiveness of specific activities, on the quality of products and services, and on customer satisfaction. Historically, functional units were established because they represented logical ways to divide the work and manage the specialized skills that companies need to accomplish their goals. There is no clear relationship, however, between the departmental units that exist in most companies and the outcomes and measures that most executives track carefully. This is one reason for the shift to divisional and product line managers and for installing process managers who are responsible for entire value chains. When one looks at an entire product line or a complete value chain, one is in a much better position to see how changes in the work result in increased or decreased costs or sales.

Key Measurement Terms

We'll start with a few definitions of popular measurement terms, and then proceed to a discussion of how processes can be measured.

- A *unit of measure*—a phrase that describes the type of data or the outcomes you are interested in (e.g., cash flow, return on equity, sales).
- A *target*—specifies what will be considered a success (e.g., cash flow equal to last quarter, or cash flow of $28 million/month).

Business Process Change. https://doi.org/10.1016/B978-0-12-815847-0.00005-4

- A *timeframe*—specifies when the measure will be taken (e.g., last quarter, or monthly).

Here are a few more terms:

- A *goal* describes an outcome. In effect, it describes a unit of measure (e.g., profitable, technology leadership).
- A *KPI* is usually just another name for a goal. Goals are usually associated with strategy, while KPIs are usually associated with managerial performance evaluations.
- A *vision statement* describes an outcome and may include a target set in the future (e.g., most profitable in our industry by the end of 2025).
- An *objective* (or *measure*) combines a unit of measure with a target and a timeframe. Thus, unlike a goal or vision statement, which can't be precisely evaluated, an objective can be evaluated.
- *Data* are raw numbers or documented events that can be used to describe results and to determine whether a target is met or not. Good measurement systems describe where, when, and how data are to be captured or gathered. Identifying a target isn't much use if employees can figure out how to gather data to show that the target is being met.

Figure 5.1 pictures a continuum that emphasizes the wide range of these terms from the very specific to statements that are vague and generic.

In our discussions in this book we have indirectly hinted at various ways we could define goals or measures. Organizations have committees of executives that define strategies and goals for their organizations. Process teams interview customers and other stakeholders to determine what they value. In an ideal world the goals that senior management set for the organization should align with the outcomes that customers or other stakeholders value, although in some cases they may not. For example, you could imagine an organization that had decided to exit a specific business, and was gradually withdrawing resources and people to shift them to a newer business initiative. In such a case customers of the older business might be upset with the service being offered, but the organization might find that acceptable as they were more concerned with establishing the new line of business quickly. Similarly, as we indicated earlier, different stakeholders may value different outcomes. Customers may value a great product at a low price. (Many process consultants place a great deal of stress on

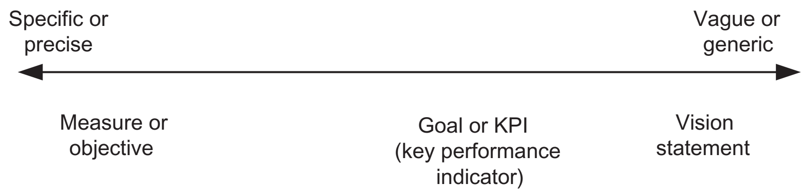

FIGURE 5.1

Measurement continuum.

satisfying customers and suggest building measurement systems from the outside in. We certainly agree that defining and satisfying customers is important—but an organization can be put out of business if it fails to satisfy any of its key stakeholders, so it is probably more important to emphasize satisfying stakeholders than to emphasize satisfying customers, as such.) Banks and shareholders, for example, value a return on their investment, and will stop financing a company if they don't get it. Government regulators may value timely tax payments or documented conformance with regulations. Management may launch a new initiative to adopt a new technology in the coming year. Employees may value a low-stress work environment, or a high salary and lots of growth opportunities. Suppliers may value a relationship that is predictable and results in prompt and correct payments, and so forth.

Internal and External Measures

Another way of talking about goals or measures is to ask whether the data are derived from within a given process, or if they are derived from sources external to the process you are focused on. *External measures* (measures from outside) tell you about the results achieved by a process or value chain. Internal data (measures from inside) tell you about how the process is working, but they don't tell you if the process is satisfying its stakeholders—be they customers or shareholders. Ultimately, we judge the success or failure of a process by external results. In the case of a value chain those results may be from entities external to the entire organization, as customers are (see Figure 5.2). In the case of smaller processes the external or outside data may derive from a downstream or management process that either values the outputs of the given process or finds them unsatisfactory (see Figure 5.3).

Figure 5.2 provides an overview of the distinction. Note that the emphasis is on the value chain, and not on subprocesses, such as C, D, E, and F. Process C in the value chain shown in Figure 5.2 has an output. We could measure the output of process C separate from any measures we might establish with regard to process C's internal activities, but that output measure is not an external measure of the value chain.

If we are focused on the organization, then the customer is outside the organization. That said, we can apply this same concept inside an organization, or even a

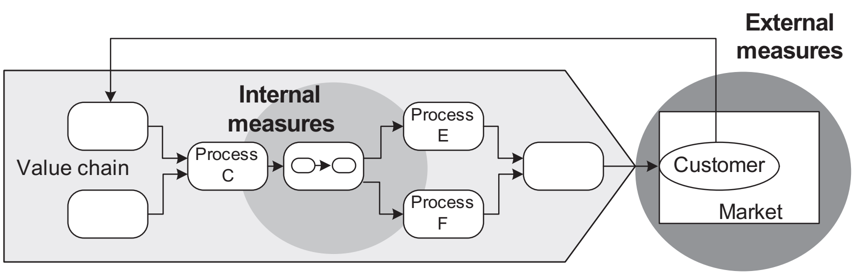

FIGURE 5.2

External and internal measures of process performance.

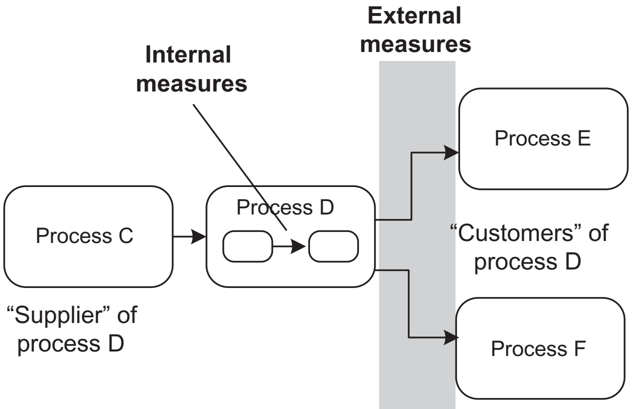

FIGURE 5.3

Internal "customers" are "external" to the processes that supply them.

process, if we simply regard any process that receives another process's outputs as its customer. Thus in Figure 5.3 we see that processes can be both the supplier of one process and the customer of another. In this case process D has two external customers: process E and process F. Before the manager of process D considers examining whatever internal measures are used to evaluate process D, he or she should be sure that process D's outputs are satisfying its customers: process E and process F. The logic here is the same as it is at the enterprise level. It doesn't make any sense to decrease the cost or to increase the productivity of process D if, as a result, the process is no longer able to deliver the products or services it provides to process E and process F. Once the external measures are defined and it's clear that process D can consistently meet its external commitments, then, while keeping its external measures constant, the process manager should focus on improving internal measures.

Using this same logic, support processes usually have core processes as their customers. We evaluate the *hire employees* process by checking to see if the core processes that received new employees are happy with the results. This is especially important when considering support processes because support process managers often use internal rather than external measures to evaluate their work. Hiring employees quickly and cheaply are important results, but only if we are also sure that the processes that requested new employees are happy with the employees they were given.

External measures are the ultimate measures of whether your company or process is succeeding. Focusing on the company for the moment, examples of external measures we might want to examine include:

- Income measures
- Measures of customer satisfaction
- Market growth measures
- Stockholder satisfaction or other external measures of the stock market's confidence in what the company is doing

Examples of internal measures we might want to look at include:

- Efficiency and effectiveness of specific functions or subprocesses
- Costs of producing the product or service
- Quality of internal outputs

It's usually easier to define or measure internal metrics than to measure external results. Moreover, most functional units tend to focus on internal measures. In fact, as we will see in a moment, one often focuses on internal measures because they are leading indicators and provide managers with valuable information. Ultimately, however, to effectively evaluate the performance of an organization you must focus on the external measures. Once you "lock down" the external measures, then you can begin to focus on improving your internal measures, confident that any efficiency you achieve will result in a real benefit to the organization. If you fail to lock down the external measures first, however, you run the risk that you will improve internal efficiency or reduce production costs at the expense of customer satisfaction, market growth, or the organization's share price. We know of a company that did exactly that. They announced that bonuses would depend on a 20% cut in costs. Costs dropped and customer complaints soared. Products were delivered late, they had more defects, and service became harder to obtain. The company quickly halted its drive for cost cuts and instituted a program that measured customer satisfaction. Once that program was in place and managers were getting monthly reports on customer satisfaction the company reinstated the cost-cutting drive, making it clear that customer satisfaction came first and cost cuts though desirable came second. However, bonuses would only be given for units that cut costs while maintaining customer satisfaction.

Leading and Lagging Indicators

Another way to think about metrics and measures is to focus on whether they measure something that can suggest action, or whether they simply report on a situation that one can do nothing about. This focus is on using performance measures to help managers make decisions. Leading indicators are measures that report on situations that are causally related to outcomes that you desire. Lagging indicators describe situations that can't be changed.

Imagine you are a sales manager for Widgets, Inc. The executive board adopts a strategy that calls for the expansion of Widget's presence in the market. This is translated into a specific goal: the company will increase its sales by 15% each quarter of the year. You can wait till the end of the quarter and then determine how many widgets you sold. That measure, however, is a lagging indicator. Once the quarter is over you won't be able to do anything about the number of sales you made during the quarter. You'll know if you achieved your goal or not, but you won't be in any position to change the results. Now let us assume you have been tracking your widget sales for some time and know that about 10% of your leads normally result in qualified prospects, and that your salespeople can typically arrange calls with half the

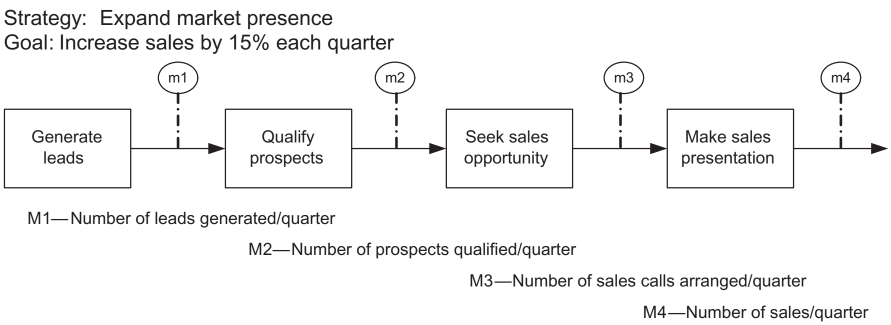

FIGURE 5.4

Simple sales cycle with three leading and one lagging measure.

qualified prospects. You also know that your salespeople, on average, sell widgets to 20% of the customers they call. Figure 5.4 illustrates the widget sales cycle we just described.

If you know that your salespeople are scheduled to make 100 sales calls this quarter, you can predict that you will be making about 20 sales. Thus, *sales calls scheduled* is a leading indicator of successful sales. It comes rather late in the sales cycle, however, and may not give you much time to make corrections. The best leading indicator in this case would be to track leads. A quick calculation shows that you get one sale for each 100 leads. Or, to look at it a little differently, to increase your sales by 15 in a quarter, you will need to get 1500 more leads. If you track leads per month, you will know at the end of the first month in the quarter if you are on track. If you aren't you will need to sharply increase the effectiveness of your lead generation process in the second month or you will be unlikely to meet your goal.

As a generalization, whenever possible it is good to monitor leading indicators that provide managers with the ability to take corrective action. Ultimately, of course, you are also going to want to know exactly how many sales you made in the quarter, so you will end up measuring both leads and sales, but the leading indicator will be more useful to the process manager who wants to use the measure to help achieve his or her goals.

Developing a Comprehensive Measurement System

Too many organizations don't bother to pull all their measures together into a system, and they confuse their managers and employees by seeking different things under different headings. Some have goal systems based on functional units or on customers, but don't specify the goals and measures for processes. Some executives pursue financial goals without making an effort to specify what success in what processes is necessary to lead to achieving the financial goals.

This mix of potential goals can result in confusion if the organization fails to develop a system that balances and prioritizes its various goals. At the enterprise level a major goal of those concerned with process work is to specify a measurement system that can link strategic goals, stakeholder goals, and internal process goals into one consistent system.

Balanced Scorecard and Process Measures

One of the popular approaches to defining a comprehensive measurement system is the Balanced Scorecard system. The system was popularized by two authors associated with Harvard, but there are many variations of the approach that are used by specific organizations. We discussed Kaplan and Norton's Balanced Scorecard approach in Chapter 2, when we considered how the Balanced Scorecard could be used to define an organization's strategy. The approach is even more popular as a tool to define managerial responsibilities and to align the goals and measures used to evaluate the performance of managers.

The basic idea is very straightforward. Kaplan and Norton began by arguing that "what you measure is what you get," and that "an organization's measurement system strongly affects the behavior of managers and employees." They go on to say that "traditional financial accounting measures, like return on investment (ROI) and earnings per share, can give misleading signals for continuous improvement and innovation." To counter the tendency to rely too heavily on financial accounting measures, Kaplan and Norton argued that senior executives should establish a scorecard that took multiple measures into account. They proposed a balanced scorecard that considered four types of measures:

- **Financial measures**: How do we look to shareholders?
- **Internal business measures**: What must we excel at?
- **Innovation and learning measures**: Can we continue to improve and create value?
- **Customer measures**: How do customers see us?

Figure 5.5 illustrates a scorecard of a hypothetical company discussed in Kaplan and Norton's January–February 1992 article (Note that as we use the term measure or objective the phrases that Kaplan and Norton show on this figure are really just goal statements.)

The initial book on the Balanced Scorecard methodology appeared just as business process reengineering was taking off in the early 1990s. Subsequent articles emphasized important ideas, like linking processes to customer concerns and linking measures to strategies. Many of the early business process theorists emphasized the importance of measurement, but didn't provide specifics about how to accomplish it. It became popular for business process gurus to mention the Balanced Scorecard when asked to explain how to align strategies, processes, and measures. The Balanced Scorecard approach has grown in popularity and today a large number of companies

ECI's Balanced Business Scorecard			
Financial perspective		**Internal business perspective**	
Goals	Measures	Goals	Measures
Survive	Cash flow	Technology capability	Manufacturing geometry vs competition
Succeed	Quarterly sales growth and operating income by division	Manufacturing experience	Cycle time, unit cost, yield
Prosper	Increased market share and ROI	Design productivity	Silicon efficiency, engineering efficiency
		New product introduction	Actual introduction schedule vs plan
Innovation and learning perspective		**Customer perspective**	
Goals	Measures	Goals	Measures
Technology leadership	Time to develop next generation	New products	Percent of sales from new products, Percent of sales from proprietary products
Manufacturing learning	Process time to maturity	Response supply	On-time delivery (defined by customer)
Product focus	Percent of products that equal 80% sales	Preferred supplier	Share of key accounts' purchases, Ranking by key accounts
Time to market	New product introduction vs competition	Customer partnership	Number of cooperative engineering efforts

FIGURE 5.5

Electronic Circuit Inc.'s balanced business scorecard.

From a figure in Kaplan and Norton's "The Balanced Scorecard—Measures that Drive Performance."

implement it in either the original way advocated by Kaplan or Norton or in some more tailored manner. Indeed, it has become so popular that many people use the term Balanced Scorecard to refer to any approach to organizing management performance measures, although most stick with the basic principles laid out by Norton and Kaplan.

In their September–October 1993 *Harvard Business Review* (HBR) article "Putting the Balanced Scorecard to Work," Kaplan and Norton offered an overview of how one could link the Balanced Scorecard to corporate strategies. Figure 5.6 provides an overview of the approach they proposed. The overall pattern is familiar to anyone who has worked in strategy and measurement. We described it earlier when we introduced measurement. The particular aspect that reflects Kaplan and Norton's contribution is the emphasis on defining four different types of strategies and generating four different types of measures.

The Balanced Scorecard has proved popular for many reasons. The most important reason was simply that it served as a wake-up call in the mid-1990s. Many senior managers were relying too heavily on financial measures, and a straight-forward model that suggested how they might rely on other measures, including process measures and customer satisfaction, proved popular.

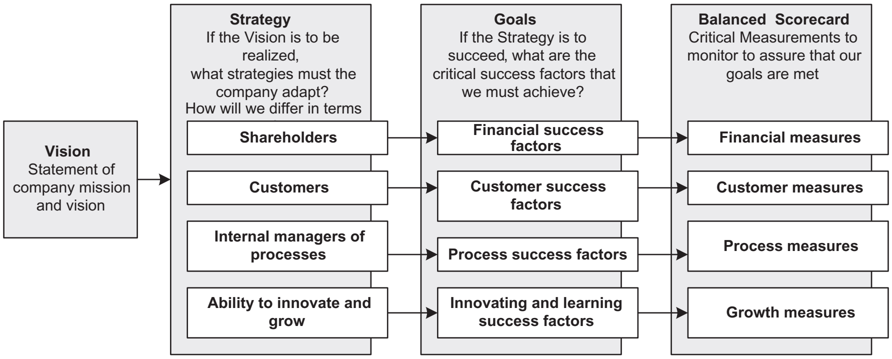

FIGURE 5.6

Linking strategies to Balanced Scorecard measures.

In 2000 Kaplan and Norton wrote a new book and another HBR article “Having Trouble with Your Strategy? Then Map It (*Harvard Business Review*, September–October 2000). The new article expanded their description of how one aligned measures and strategic goals. They came up with what they termed “Balanced Scorecard strategy maps.” In essence, they introduced a hierarchical model that suggested some measures could contribute to others and could be summed up in shareholder value. Figure 5.7 summarizes the idea behind Balanced Scorecard strategy maps.

One problem we have with Figure 5.7 is that it seems like it’s moving back to where Kaplan and Norton began in the 1990s. We have gone from the idea that senior managers should not rely exclusively on financial measures, but on four balanced sets of measures, to the idea that there is a hierarchy of measures at the top of which are financial measures. It’s easy to imagine that some executives will look at Figure 5.7 and conclude that they can simply monitor financial measures, and leave the rest to lower level managers. In our opinion the basic Balanced Scorecard idea is very useful, but it should be more closely tied to a process view of the organization. From a process perspective, activities are directly linked to customer satisfaction. Breaking them up and arranging them in a hierarchical fashion reflects a functional or departmental mentality. We’ll come back to this point later and suggest how we would deal with the problem. In the meantime it is worth noting that many organizations that have embraced the Balanced Scorecard approach usually did so by conceptualizing the different boxes in the scorecard as being the responsibility of different functional units. Thus, sales and marketing generate the goals and measures for the customer perspective, while operations and manufacturing usually generate the goals and measures for the internal business (or process) perspective. Table 5.1 illustrates some typical functional and process goals.

Most organizations that use the Balanced Scorecard work in a top-down manner, first creating a scorecard for the organization and then assigning specific goals to functional managers. Then each department derives its own scorecard that emphasizes the goals and measures the department thinks it can effect. The process is then

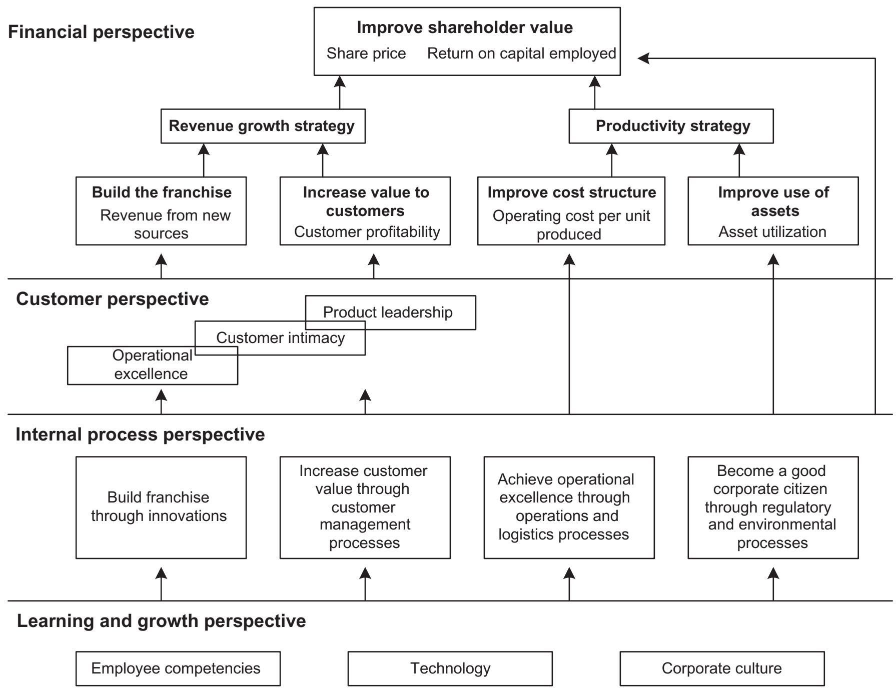

FIGURE 5.7

Balanced Scorecard strategy maps.

Modified from a figure in a Harvard Business Review, September–October 2000 article.

driven down from the head of the department to his or her reports and then to their reports, as pictured in Figure 5.8. If too much emphasis is placed on functional units, then the card is divided up as it goes down the hierarchy and different quadrants become the primary responsibility of different functional units. Unfortunately, used as it is in most companies, the Balanced Scorecard system tends to support and entrench functional specialization.

Aligning Process Measures

Now let's consider an entirely different approach to aligning process goals and measures. In this case we are dealing with an organization that is totally committed to process. At a minimum the organization has a division that is focused on producing a specific product line. Or it might be a company that is organized around undertaking projects. The specific example we will look at involves an aerospace company that undertook a project to create and deliver a set number of highly specialized aircraft to the US Air Force. The company was Boeing, and the contract (project) was undertaken by the Boeing Global Mobility Systems (GMS) unit. Specifically,

Table 5.1 A Comparison of Some Functional and Process Goals (or Key Performance Indicators)

Department or Function	Typical Departmental Goals (or KPIs)	Typical Process Goals (or KPIs)
Sales department	• Cost of sales • Revenue ($)	• Timely and accurate submission of orders • Timely and accurate entry of new orders • Cost of processing orders
Production department	• Cost of inventory • Cost of labor • Cost of materials • Cost of shipping	• Timely order scheduling • Timely and accurate production of orders • Timely shipment of orders • Cost of unit production and shipping costs
Finance department	• Percent of bad debt • Mean labor budget	• Timely and accurate invoice preparation • Timely and accurate credit checks for new accounts • Cost of processing an invoice
External organizational measures	• Gross revenue • Cost of sales • Growth of customer base • Price of stock	• Percent of on-time delivery • Percent of rejects • Customer satisfaction as measured on survey or index

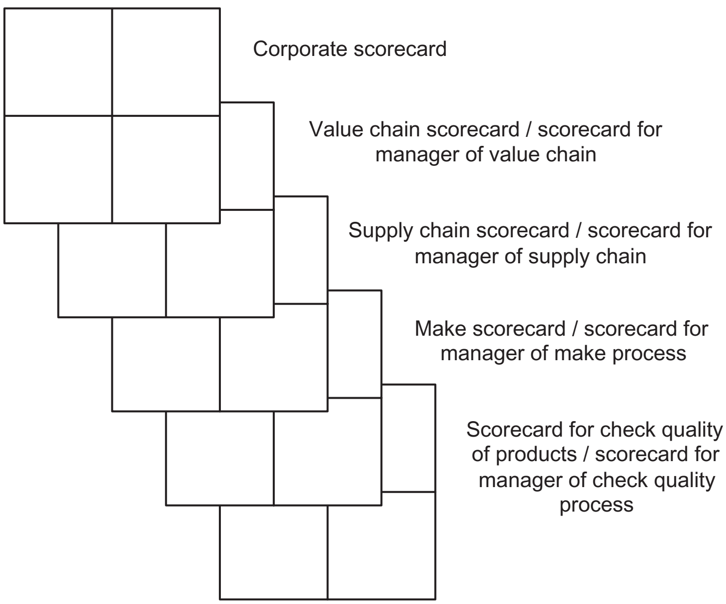

FIGURE 5.8

Hierarchy for a functional chain of managers.

the contract was undertaken to deliver the C-17, a giant aircraft than can transport military tanks, trucks, and heavy equipment. Imagine the project described as a very general process, as illustrated in Figure 5.8. The output of the project is C-17 aircraft. The customer is the US Air Force. The quality and the cycle time for the project are precisely specified. Each plane is carefully evaluated by the Air Force and either accepted or rejected. Thus the ultimate external measure is the acceptance or rejection of C-17 aircraft, coupled with supplying the required number of aircraft on time, as specified in the contract.

Using a diagram like the one shown in Figure 5.8 we can align our process measures by "backing" into the process and writing "contracts" that define the relationships between each of the processes and subprocesses in the value chain. At the highest level Boeing has a contract with its single customer, the US Air Force. Boeing has agreed to deliver a set number of C-17 aircraft for an agreed-upon price within a given time and of a set quality. This external contract is represented by the top gray circle in Figure 5.9.

The value chain is made up of three core processes: 1, 2, and 3. Since core process 3 actually generates the product that is delivered to the Air Force, in effect the contract between the Air Force and core process 3 is exactly the same as Boeing's overall contract. Now we back up and ask the manager of core process 3 what he or

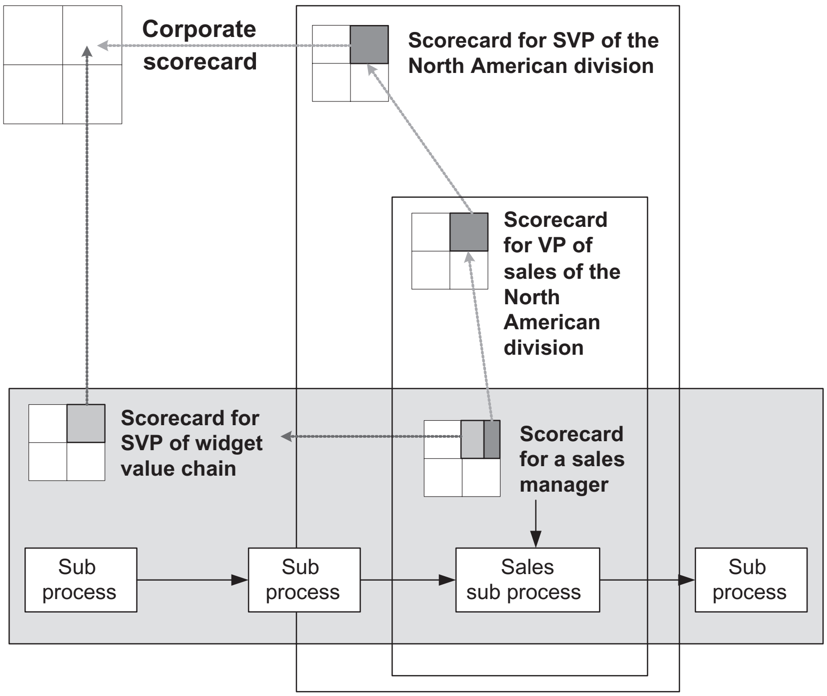

FIGURE 5.9

Balanced Scorecard system that supports both functions and processes.

she will need to meet the contract with the Air Force. The manager on core process 3 must consider what's involved in core process 3 and then negotiate a contract with the manager of core process 2. This is represented by the dark circle between core process 2 and core process 3. In essence, the manager of core process 3 agrees that he or she can meet their contract with the Air Force as long as core process 2 meets its contract with core process 3.

This alignment process can be driven down to any arbitrary level in the process hierarchy. Thus, for example, core process 1 is made up of three subprocesses. The final subprocess in core process 1 must meet the contract that is established between the managers of core process 1 and core process 2. To ensure alignment the manager of subprocess 1.3 must write a contract with the manager of subprocess 1.2 that defines what subprocess 1.3 will need if it in turn is to meet its contract with core process 2. In a similar way this obligation can be passed by other contracts back from subprocess 1.2 to subprocess 1.1. Thus, eventually, an entire value chain and all its processes and subprocesses can be linked by sets of contracts that define what each operational process must do to ensure that the downstream or "customer" process succeeds. We don't picture it on this diagram, but other contracts can be written by process managers to define what support they require to meet their output agreements.

This is a very process-oriented way of thinking about outcomes and measures. It largely ignores functional concerns and puts all the emphasis on ensuring that each process and subprocess manager knows exactly what is required and generates output ("external") measures for each process and subprocess. Any process (or process manager) that fails to meet its contract can be instantly identified and corrective action initiated.

Not all organizations can embrace an approach that puts as much emphasis on process as Boeing GMS does. When it is done, however, it makes it possible to create a very rigorous system of measures, all carefully aligned. And, of course, it makes it possible to establish performance criteria for process managers with an equal degree of rigor.

Deriving Measures From Business Process Frameworks

In the last chapter, when we discussed business process frameworks, we mentioned the fact that both the Supply Chain Operations Reference (SCOR) model and the Value Reference Model provide measures for each of their processes. Figure 5.10

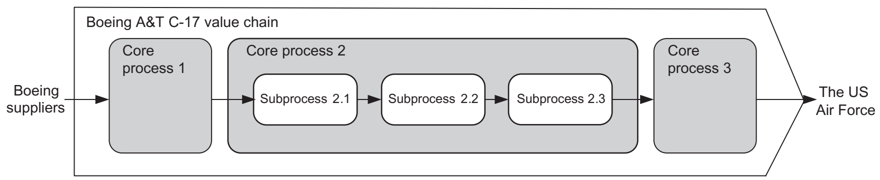

FIGURE 5.10

Overview of a Boeing value chain that produces C-17 aircraft for the US Air Force.

provides an overview of the measures used in the SCOR supply chain process. The five high-level SCOR measures are divided between external (customer-facing) and internal measures.

If a company uses a framework like SCOR to structure its business process hierarchy, then it can proceed to derive appropriate measures from SCOR reference materials. The *SCOR Reference Manual* contains definitions for all processes included in the SCOR framework, the metrics appropriate for evaluating each process at each level, and definitions of how each measure is to be calculated. The following extract from Version 7.0 of the *SCOR Reference Manual* gives an overview of a sample of the metrics available. In this case we are looking at the reference material provided for a specific Level 2 process—Make (Variation: Make-to-Order)—and then for a Level 3 process within that *make* process. In the body of the reference manual measures are referred to by name. In an appendix of the manual each measure is precisely defined. We give the measures appropriate to the processes first, and then the definitions of specific measures.

SCOR defines five generic performance attributes and then suggests appropriate metrics for each attribute. Different companies will choose different metrics as KPIs, depending on the nature of the industry, the supply chain, and the performance that the company seeks to monitor and improve.

An example of Level 2 Make (M2) process follows:

Level 2. Make Process—Variation: Make-to-Order: M2

Process definition: The process of manufacturing in a make-to-order environment adds value to products through mixing, separating, forming, machining, and chemical processes. A make-to-order environment is one in which products are completed after receipt of a customer order and are built or configured only in response to a customer order.

Performance Attributes	Appropriate Metrics
Reliability	Perfect order fulfillment
Responsiveness	Make cycle time
Flexibility	Upside make flexibility
	Downside make adaptability
	Upside make adaptability
Cost	Plant operating cost per hour
	Indirect to direct headcount ratio
	Cost/unit
	Indirect to direct process cost ratio
	Product losses (sourced/in process/finished)
Assets	Cash to cash cycle time
	Inventory aging
	Return on supply chain fixed assets

Two examples of Level 3 subprocesses of the Make (M2) process follow:

Level 3. Schedule Production Subprocess—Variation: Schedule Production Activities for Make-to-Order: M2.1

Subprocess definition: Given plans for the production of specific parts, products, or formulations in specific quantities and planned availability of required sourced products, the scheduling of the operations to be performed in accordance with these plans. Scheduling includes sequencing and, depending on the factory layout, any standards for setup and run. In general, intermediate production activities are coordinated prior to the scheduling of the operations to be performed in producing a finished product.

Performance Attributes	Appropriate Metrics
Reliability	Percent of orders scheduled to customer request date schedule achievement
Responsiveness	Schedule production activities cycle time
Flexibility	None identified
Cost	Work in progress inventory days of supply
	Scheduling resource costs as percent of make costs
	Plant level order management costs
Assets	Capacity utilization

Level 3. Issue Sourced/In-Process Subprocess—Variation: Issue Sourced/In-Process Activities for Make-to-Order: M2.2

Subprocess definition: The selection and physical movement of sourced/in-process products (e.g., raw materials, fabricated components, subassemblies, required ingredients, or intermediate formulations) from a stocking location (e.g., stockroom, a location on the production floor, a supplier) to a specific point of use location. Issuing product includes the corresponding system transaction. The bill of materials/routing information or recipe/production instructions will determine the products to be issued to support the production operation(s).

Performance Attributes	Appropriate Metrics
Reliability	Inventory accuracy percent parts received at point of use
Responsiveness	Issue sourced in-process product cycle time
Flexibility	None identified
Cost	Inventory obsolescence
	Inventory days of supply
Assets	None identified

An example of a metric definition for the reliability metric for the Level 2 process is as follows:

Level 2 Metric: Perfect Order Fulfillment

Metric definition: The percentage of orders meeting delivery performance with complete and accurate documentation and no delivery damage. Components include all items and quantities on time using customer's definition of on time, and documentation—packing slips, bills of lading, invoices, etc.

- A product is considered perfect if the product ordered is the product provided.
- A quantity is considered perfect if the product ordered is provided in the ordered quantity.
- A delivery is considered perfect if the location and delivery time ordered are met upon receipt.
- A customer is considered perfect if the product is delivered to the specified entity.
- Documentation supporting the order line is considered perfect if it is all accurate, complete, and on time.
- The product condition is considered perfect if the product is delivered/faultlessly installed (as applicable) according to specifications with no damage, customer ready, and is accepted by the customer. Faultlessly installed (as applicable), correct configuration, customer ready, no damage, on specification.

Calculation: (total perfect orders)/(total number of orders)

The Supply Chain Council (SCC) not only provides a comprehensive set of measures for the processes included in their supply chain, design chain, and sales and marketing frameworks, but they also work with an outside benchmarking agency so that companies using the SCC's measures can get benchmark information on the same measures. To use the SCC's framework, measures, and benchmarks an organization needs to join the SCC. Once that is done, however, the company has free access to a comprehensive process measurement system that it can use to rapidly develop its own business process architecture.

A Process-Driven Approach to Defining Measures

We'll end this chapter by describing how we personally approach the development of a process measurement system. Our approach depends on developing a list of stakeholders for the value chain or the specific process on which we are focused, and then developing a list of measures that describes what would satisfy each stakeholder.

In our experience most process measurement approaches spend too much time talking about architecture, corporate goals, strategies, and initiatives. These are all important issues but, if they are treated as separate concerns, they tend to cause more confusion than provide focus. What's needed is a simple diagram that allows us to pull together all the information we need in a manner that is clearly focused on the process that we need to redesign. To extend the ideas we are considering here, one simply starts with a value chain and then subdivides it into Level 1 processes, then those into Level 2 processes, and so on.

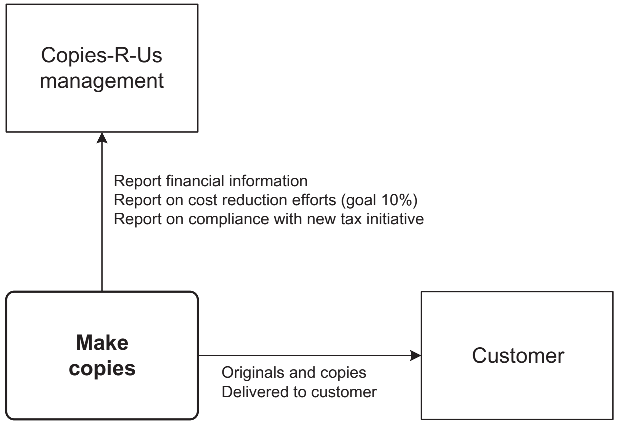

FIGURE 5.11

Stakeholder diagram of the *make copies* process.

Whichever level you use as your starting point, you begin by naming the value chain or process to be measured. We'll keep our example simple and consider a copy center with a single value chain: *make copies*. This value chain includes everything involved from when the customer requests copies to when the copies are delivered to the customer.

We begin with a rectangle with rounded corners (a standard icon for a process) and label it. Next we add boxes to represent stakeholders, and use arrows to show what the stakeholders expect from the process (see Figure 5.11). As we are using the term, a *stakeholder* is anyone outside the process, including persons, processes, systems, or institutions that have an interest in the success or failure of the *make copies* process.

One obvious stakeholder is the customer, who depends on the process to achieve some goal. In the case of the *make copies* process the customer needs copies and depends on the process to prepare those copies. Another key stakeholder is the management of the copy store. They depend on the process to generate the income that the store was established to generate. We term the diagram created by adding stakeholder boxes to a process box a stakeholder diagram.

The relationship between the customer and the *make copies* process is easily understood. The customer generates an order, provides money and specifications, receives the copies, and, hopefully, is happy with the result.

The relationship between the *make copies* process and management is a bit more complicated. Here's where strategy, goals, and initiatives come into play. Management sets goals for the process and it provides policies and financial resources that constrain the activities of those engaged in the *make copies* process. Management may mandate changes in the technologies being employed. In a nutshell, all the information that more complex process methodologies might seek by other means can be quickly captured on a simple diagram like the one in Figure 5.8 by simply noting how management constrains and what management expects from the process. Management is a stakeholder with expectations and this diagram should allow the organization to make that information explicit.

If the *make copies* process was a value chain process that produced the main product of a photocopying store, management would be very concerned with the ROI of the process. If, on the other hand, there was a copying process located several layers down within a value chain designed to produce and sell life insurance policies, management might not care much about the process, simply regarding it as a utility. Similarly, the customer for the photocopy store's *make copies* value chain would be the primary customers of the organization, while the customer for the copying process buried within a life insurance sales process might simply be a few other rather modest processes. None of this changes how one develops performance measures for processes, but it reminds us that the interface concerns for management and customer can vary quite a bit, depending on the process we are describing.

Let's return to our copies example and to management's concerns. In the case we are looking at, the process is a value chain for a small copy shop. Thus the management of the organization might well have a strategy, and the management team might well adopt a set of initiatives, depending on their goals and the nature of the market. Thus, for example, the management team might have an initiative to reduce costs by 10%. Similarly, they might have an initiative to comply with some new tax regulation that required a new type of report on employee earnings each quarter. In effect, both of these concerns would be incorporated into our diagram as things with which management was concerned.

Let's consider some other possible stakeholders (Figure 5.12). Common stakeholders include business partners who supply or receive outputs from the process,

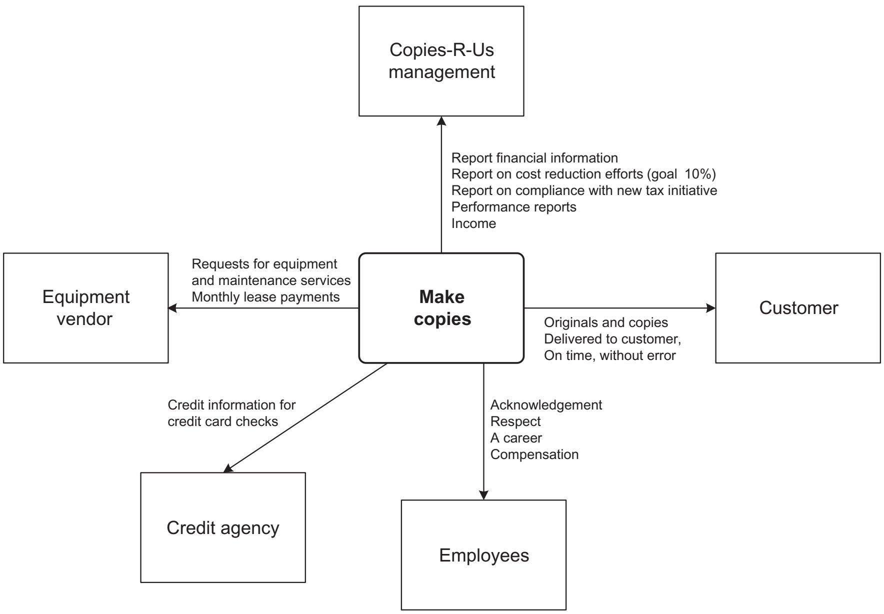

FIGURE 5.12

Make copies process with more stakeholders shown.

From SCOR Reference Manual.

government agencies that receive reports on income from the process (sometimes stated as independent stakeholders if the process generates the payment, but otherwise added as a management concern), and employees. The copy shop, for example, may use an outside company to clean its premises at night. It may lease equipment from a copy machine manufacturer and expect that manufacturer to provide services and so forth. The copy shop may think its employees are easy to replace and may not place a high premium on retaining them. Although if they are in fact concerned with reducing costs, then retaining employees rather than going to the expense of hiring and training new employees is probably important to the copy store. A software game company that competes for key employees, however, might think about the matter very differently and be very concerned with the happiness of its game designers.

With a little work a business team can usually define a process and then generate a complete list of important interactions. Once this has been done, defining KPIs follows naturally. One knows a process is successful if it satisfies its stakeholders. The list of things that are required to satisfy stakeholders can easily be converted into a set of measures that one can use to evaluate the success of a process. In effect, a list of the stakeholders serves as a scorecard for our process.

There is also some confusion about how one uses terms. Most process people use the term "key performance indicator" to indicate a rather vague goal. In that case they usually associate KPIs with specific "objectives" which they quantify, specifying the item to be measured, the appropriate target, and a time criterion. Thus one of the customer's KPIs might be "copies delivered when promised." We could then translate this into the objective "95% of orders ready at the time promised." Similarly, a management KPI might be to "meet cost reduction goals," while the objective might be "reduce costs by 10% by the end of the 1st quarter."

Once the diagram (Figure 5.13) is complete we go on to develop a worksheet. In essence, the team lists each stakeholder, the key concerns of each stakeholder, and then creates formal KPIs and objectives for each stakeholder concern.

Process performance scorecard: Make copies process			
Shareholder	**Interest in process**	**KPI**	**Objective**
Customer	Original and copies Delivered without error Delivered when promised Delivered at a reasonable cost	Copies delivered without error Copies delivered when promised Costs equal to or less than any competing store	Orders delivered without error 95% of time Copies delivered when promised 95% of time Costs equal to or less than competing stores within 10 mile radius
Management	Income Financial reports Performance reports Achievement of cost-reduction goals	Income Financial reports correct and on time Performance reports Achievement of cost-reduction goals	Gross cash return of $500,000/quarter ROI of 20% each quarter Financial reports corrected and submitted on Friday of each week Performance reports submitted each month Gross costs of Make copies operations reduced by 10% for first quarter
Etc.			

FIGURE 5.13

Portion of a process performance measures scorecard.

One might object at this point that we have only considered "external" measures, and not considered "internal" measures such as how many hours employees worked, or the waste generated by specific subprocesses. If one was really focused on reducing costs, for example, one would probably want to measure several internal measures. Our response is that at this point we are only focused on external measures. External measures tell you what the process is accomplishing. They are the only sound basis for KPIs. At the same time, however, if you want to improve a process, or even manage it effectively, you will probably need a number of internal measures that correlate with the external measures or at least give you a good idea of the likelihood of achieving the external measures. Deriving internal measures from external measures is a separate process that depends on an analysis of the internal structure of the process, and which won't be discussed here for lack of time and space. Our goal here has been to assure that we have a complete set of external measures to use in monitoring the performance of a given process.

The development of a stakeholder diagram assures that the process team has a clear set of goals for a process. Moreover, done as we have suggested with an equal emphasis on customers, management, and other key stakeholders, it generates a complete list of measures for a process. It also provides the foundation for the derivation of more precise internal measures that are used when one tries to improve a process.

As we indicated earlier, many methodologies use a variety of diagrams and worksheets to define an organization's goals and initiatives. Others get lost in discussions of process outcomes for customers and how they square with management concerns for things like ROI or staying within budget. The stakeholder diagram captures all this in a single diagram and an accompanying scorecard.

Putting It All Together

As we suggested at the beginning of this chapter, most companies are still experimenting with process management and with the specification of process-based performance measures. Most companies tend to have measures defined at the lower process levels, but they don't have performance measures at the value chain level. Moreover, they rarely have their measures tightly integrated with their strategic goals. Companies that have done work in this area tend to do it within the scope of the Balanced Scorecard framework, but this approach while useful often obscures the role of processes and overemphasizes the functional approach.

A few companies, like Boeing GMS, are far ahead of others and have a rigorous process measurement system that runs from the top right down to the smallest process in the organization. Using contracts the Boeing GMS system lines everything up and makes rigorous traceability possible.

A few companies have begun to explore the use of scorecards derived from various specialized process frameworks like SCOR.

Figure 5.14 also suggests how we can get around the layered nature of the Balanced Scorecard strategy model. Instead of thinking of customers as forming a layer, we

Value chain: The widget value chain		Level 1 process: Widget supply chain	
Goals and measures for Level 1 process: Increase customer satisfaction (reduce complaints by 50%) Reduce costs (by 15% per year)			
Level 2 processes	Process manager	Level 2 goals/process metrics	Level 2 resources
Make process	Artie Kahn	Reliability **Perfect order fulfillment** Responsiveness Make cycle time Flexibility Upside make flexibility Downside make adaptability Upside make adaptability Cost Plant operating cost per hour Indirect to direct headcount ratio Cost\unit Indirect to direct process cost ratio Product losses (sources/in-process/finished) Assets Cash to cash cycle time Inventory aging Return on supply chain fixed assets	ERP modules used Business rules used Employee training courses used
Deliver process			

FIGURE 5.14

Level 2 architecture analysis worksheet.

think of them as stakeholders of the process whose measures we wish to define. Once we add other stakeholders, such as management, business partners, and perhaps some support processes, and go on to define what each stakeholder expects from the process, we have a process scorecard that is very in keeping with either creating an organization-wide measurement system, or as a way to begin to define how we might monitor the success of a given process and analyze what we expect from a process.

Notes and References

Once again, many of the ideas incorporated in the BPTrends methodology are derived from conversations Roger Burlton and I have had. And most of my ideas on the relationship between process managers and processes derive from even earlier conversations with Geary Rummler.

Rummler, Geary, and Alan Brache, *Improving Performance: How to Manage the White Space on the Organization Chart* (2nd ed.), Jossey-Bass, 1995. Still the best introduction to measuring business processes.

Spitzer, Dean R., *Transforming Performance Measurement: Rethinking the Way We Measure and Drive Organizational Success*, AMACOM, 2007. A very nice introduction to the latest ideas on organizing performance measurement.

Lynch, Richard L., and Kelvin F. Cross, *Measure Up! Yardsticks for Continuous Improvement*, Blackwell, 1991. An older book with lots of good ideas on process measurement.

The Balanced Scorecard is a popular approach to measuring corporate and managerial performance. The term was coined by Robert S. Kaplan (a Harvard Business School accounting professor) and David P. Norton (a consultant) in an article titled "The Balanced Scorecard—Measures that Drive Performance," which appeared in the January–February 1992 issue of the *Harvard Business Review*.

Kaplan, Robert S., and David P. Norton, *The Balanced Scorecard: Translating Strategy into Action*, Harvard Business School Press, 1996. Kaplan and Norton describe a popular approach to tying measures to organization strategies. It's good in that it gets executives thinking of a variety of measures. It's bad if it's used alone as a measurement solution and not incorporated into a total business process management strategy. You can easily think of the collection of measures that accumulate as being a process that analyzes a scorecard of measures.

Kaplan, Robert S., and David P. Norton, "Having Trouble with Your Strategy? Then Map It," *Harvard Business Review*, September–October 2000. This article describes how the authors link strategy to Balanced Scorecard measures. It is available at http://www.amazon.com.

Kaplan, Robert S., and David P. Norton, *Strategy Maps: Converting Intangible Assets into Tangible Outcomes*, Harvard Business School Press, 2004. The Kaplan-Norton model often confuses the relationship between processes and measures, but it also provides lots of good insights. Read it for insights, but don't take their specific approach too seriously, or your process focus will tend to get lost. Kaplan and Norton's previous book on the Balanced Scorecard approach to strategy was *The Strategy Focused Organization* which was published by Harvard Business School Press in 2001 and it too is also worth a read.

Kaplan and Norton's books are still available and are as good as any of the many other books on the Balanced Scorecard we have seen. If you just want the basic idea, however, we suggest you buy the original *Harvard Business Review* article that is available at http://www.amazon.com.

Smith, Ralph, *Business Process Management and the Balanced Scorecard*, Wiley, 2007. This is a recent book that describes the challenges of using the Balanced Scorecard with business process management.

Most of the material on aligning processes from the top down derives from the work at Boeing GMS (formerly called Boeing A&T). The best article describing this effort is Pamela Garretson's "How Boeing A&T Manages Business Processes," which is available at http://www.bptrends.com (search for Pam Garretson).

Information on the SCC's measurement systems is from a number of SCC publications. The specific information about make-to-order process measures is from the *SCOR Reference Manual*. All SCC information is available at http://www.supply-chain.org.

CHAPTER

Process management

6

Managers plan, organize, lead, and control the work of others to achieve their goals. There are two senses in which we will discuss process management in this book. We will consider process management in conjunction with how senior managers understand the goals and activities of their organizations. Separately, we will discuss how the activities of managers impact the success of specific business processes. In this section, which is focused on enterprise issues, we will focus on understanding how the ideal of a "process" helps managers understand their organization's goals. We will also consider how an organization might organize itself to support process managers. In a separate chapter in Part II, when we consider business process redesign, we will consider how managers effect the success of specific business processes.

The Process Perspective

Managers, from the CEO down, are responsible for the ongoing activities of their organizations. To set goals and make decisions about their organizations they need to understand how their organizations are performing. There are different ways, historically, that managers have done this.

1. One approach is to think of the organization as a black box that takes in capital, and after using it generates a return in that investment. This is the perspective that managers adopt when they focus extensively on spreadsheets and other financial information.
2. Most executives take a broader view, imagine that an organization is trying to accomplish a set of goals, and monitor key performance indicators to determine if the organization is meeting its goals or not.
3. Still another approach is to focus on the organization chart, implicitly assuming that people make things happen. If the sales department is not generating the results, then the CEO considers whether or not to replace the head of sales. Similarly, the head of sales looks to see which salespeople are performing poorly, and considers replacing them with new salespeople.

We might term these approaches (1) the financial/return on investment approach, (2) the strategy and goals approach, and (3) the leadership or organization chart approach, most senior executives rely on a mix of these approaches. What all

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three of these approaches lack, however, is a systematic way of conceptualizing how everything in the organization fits together to produce results for customers. Thinking of an organization as a system or a process that takes inputs and turns them into valued outputs is a fourth approach. The reason that the process approach to management remains popular is that it integrates everything. If the organization is large, we divide it into multiple value chains, each with its own customers and stakeholders, but to keep things simple let's assume that the organization is a single value chain, as we have pictured it in Figure 6.1. Moreover, let's assume it has three basic Level 1 processes: one to design new products, one to produce products, and a third to deliver products.

The whole organization is shown in this single picture. The value chain produces products and services that are sold to customers. As time passes the organization may introduce new products or incorporate new technologies to make a better or less expensive product, but the essence of the value chain remains. Departments exist to provide people and activities needed in the major processes that make up the value chain. If we were to expand this diagram we could show the specific activities that were performed by people in specific departments that contributed to the success of the major processes in the value chain. If a department is doing something that does not contribute to the production of value for the customer or for some other stakeholder, then we need to consider dropping it. As important as the customer is, there are other stakeholders, such as the shareholders, government agencies, business partners, and employees, that need to be taken care of to ensure the value chain can continue to function.

Sales may drop, and it may be that the head of sales or specific salespeople should be fired. But it is just as likely that the process needs to be changed. Finances are

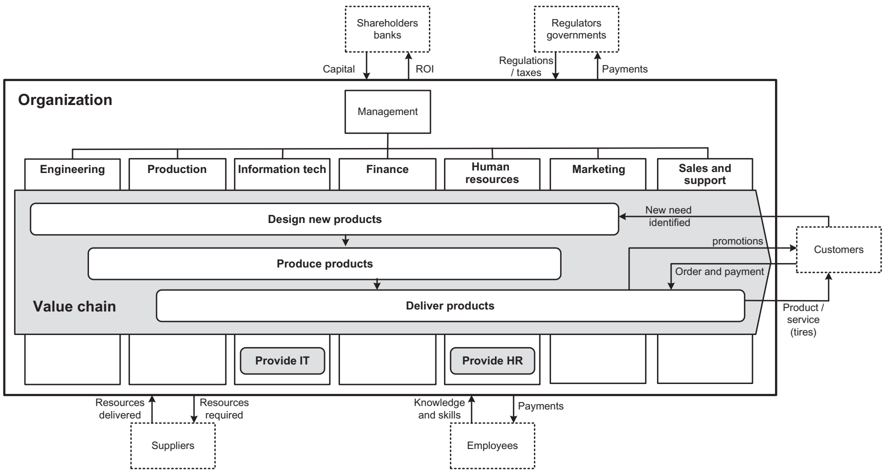


FIGURE 6.1

Overview of an organization as a single process.

critical. But cutting costs that result in poorer products and the loss of sales is not a win in the long run. A good strategy and goals are important, but once they are selected the organization needs to have a specific process to ensure that those goals are met. The process perspective is the only perspective that connects everything else together and gives you a concrete way in which to see exactly how those connections lead to positive or negative results. If you take away only one message from this book let it be this: the process perspective is the one perspective that shows a manager how everything in an organization must work together if the organization is to succeed. In this chapter we will consider how the process perspective can improve managerial practices. Similarly, we will consider how savvy managers can improve the results that can be obtained from processes.

What Is Management?

Many books have been written about management. This book is about improving business processes, so we will consider how management can be organized to support effective business processes and vice versa. Before we get into specifics, however, we need to start with some definitions. In the discussion that follows we are talking about roles and not about jobs or individuals. A single individual can fulfill more than one role. Thus, for example, one individual could perform two different managerial roles in two different situations—managing a functional department, but also serving as the manager of a special project team. Similarly, a job can be made up of multiple roles.

Broadly, there are two types of managerial roles: *operational management* and *project management*. Operational managers have ongoing responsibilities. Project managers are assigned to manage projects that are limited in time. Thus a project manager might be asked to redesign the *widget* process, or to conduct an audit of the company's bonus system. The head of a division, a department head, or the process manager in charge of the day-to-day performance of the *widget* process all function as operational managers. In the rest of this chapter we will focus on operational management. We will consider project management when we consider what's involved in managing a business process change project.

Operational management can be subdivided in a number of ways. One distinction is between (1) managers who are responsible for the organization as a whole or for functional units, like sales or accounting, and (2) managers who are responsible for processes, like the *widget* process (see Figure 6.2). All organizations have organization or functional managers, only some organizations have explicit process managers.

Functional Managers

Most companies are organized into functional units. Smaller companies tend to structure their organizations into departments. Larger organizations often divide their functional units into divisions and then divide the divisions into departments. The

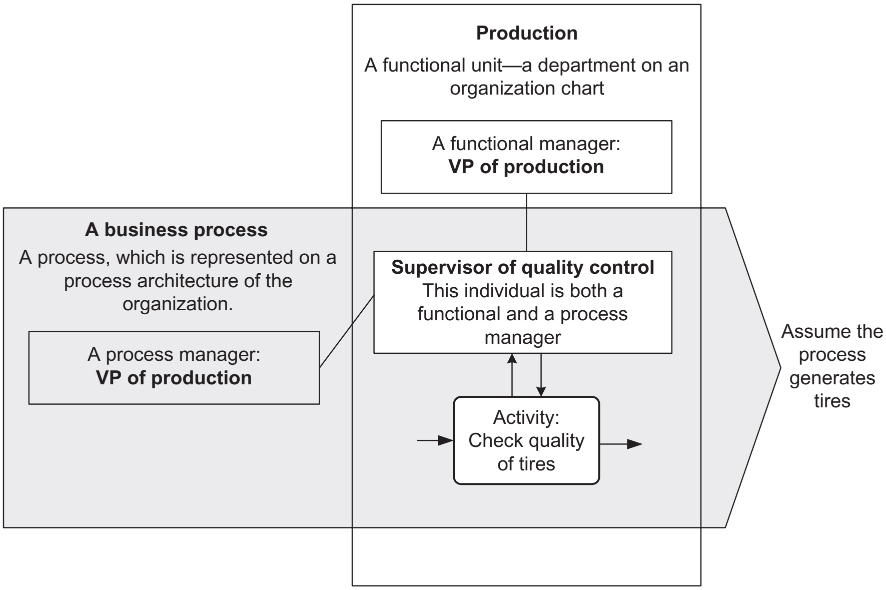


FIGURE 6.2

Two more types of managers.

definition of a division varies from company to company. In some cases a division is focused on the production of one product line or service line. In that case the division manager can come very close to functioning as a process manager. In other cases divisions represent geographical units, like the European division, which may represent only a part of a process, or even parts of multiple processes that happen to fall in that geographical area. At the same time, there are usually some enterprise-wide departments like IT or finance. Thus in a large company it is not uncommon to have a mix of divisional and departmental units and managers playing multiple roles.

Figure 6.3 illustrates a typical organization chart for a midsize company. The managers reporting to the CEO include both divisional managers (senior vice president, or SVP, widget division) and departmental managers (CIO, CFO). Some of the departmental managers might be responsible for core processes, but it is more likely they are responsible for support processes.

An organization chart like the one illustrated in Figure 6.3 is designed to show which managers are responsible for what functions and to indicate reporting relationships. In Figure 6.3 it's clear that the manager of production reports to the VP of widget manufacturing. This probably means that the VP of widget manufacturing sets the manager of production's salary with some guidance from HR, evaluates the manager's performance, approves his or her budget, and is the ultimate authority on policies or decisions related to widget production.

In many organizations mid-level functional managers wear two hats and serve as both a functional manager and a process manager. Consider the managers shown in

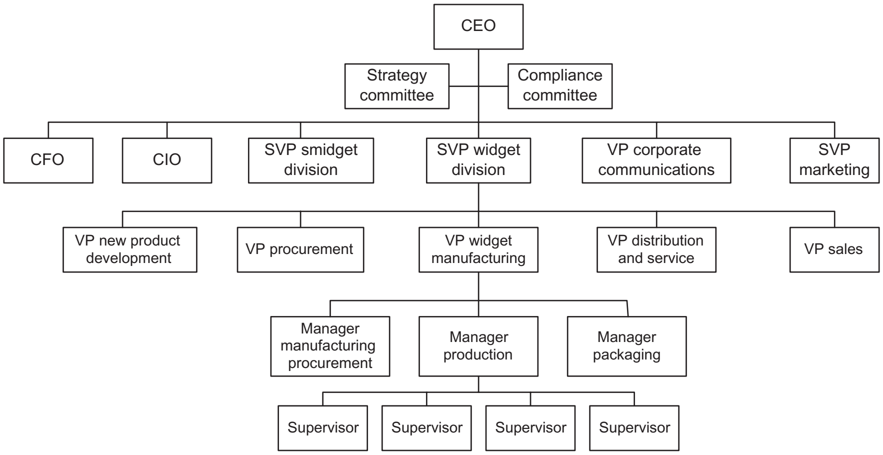


FIGURE 6.3

Organization chart describing the reporting relationships of unit managers.

Figure 6.4. In this simple example a value chain is made up of a sale, a manufacturing, and a delivery process. Each of these processes is managed by an individual who works within a functional unit and reports to the head of the functional unit. Thus the same manager—the sales supervisor, for example—is both the functional and the process manager of the *widget sales* process.

The situation shown in Figure 6.4 is very common. If problems arise they occur because functional units often defend their territory and resist cooperating with other functional units. What happens if the manufacturing process doesn't get the sales information it needs to configure widgets for shipment? Does the manufacturing supervisor work with the sales supervisor as one process manager to another to resolve the problem, or does the manufacturing supervisor "kick the problem upstairs" and complain to his or her superior? It's possible that the VPs of sales, manufacturing, and delivery all sit on a widget process committee and meet regularly to sort out problems. It's more likely, unfortunately, that the VP of sales manages sales activities in multiple value chains and is more concerned with sales issues than he or she is with *widget* process issues. In the worst case we have a situation in which the issue between the two widget activities becomes a political one that is fought out at the VP level with little consideration for the practical problems faced by activity-level supervisors. This kind of silo thinking has led many organizations to question the overreliance on functional organization structures.

Before we consider shifting to an alternative approach, however, we need to be clear about the value of the functional approach. As a strong generalization, departmental managers are primarily concerned with the standards and best practices that apply to their particular department or function. In most cases a manager was hired to fulfill a junior position within a department—say, sales or accounting—and has spent the last 20 years specializing in that functional area. He or she is a member

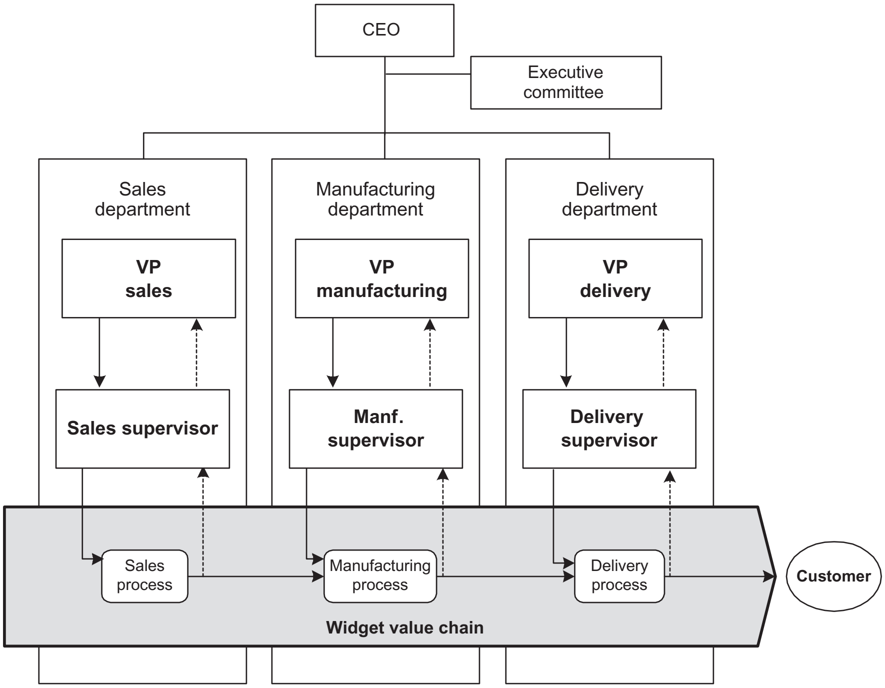


FIGURE 6.4

Functional managers who are also process managers.

of professional sales or accounting organizations, reads books on sales or accounting, and attends conferences to discuss the latest practices in sales or accounting with peers from other companies. In other words, the individual has spent years mastering the details and best practices of sales or accounting by the time he or she is appointed a VP. Such an individual naturally feels that he or she should focus on what they know and not get involved in activities they have never focused on before. This type of specialization is a very valuable feature of the functional approach. Thus, for example, bookkeepers in an organization ought to follow accepted accounting practices. Moreover, they ought to follow the specific policies of the company with regard to credit, handling certain types of transactions, etc. The CFO is responsible to the CEO for ensuring that appropriate standards and practices are followed. In a similar way the head of sales follows standard practices in hiring and motivating the sales force. Moreover, the head of sales is well positioned to recognize that a widget sales supervisor is due a promotion and conclude that she is ready to become the new sales supervisor of the *smidget sales* process when the current guy retires. Functional management preserves valuable corporate knowledge and brings experience to the supervision of specialized tasks. Sometimes, however, it results in senior managers who are very territorial and prefer to focus on their special area of expertise while ignoring other areas.

Process Managers

Since we are primarily concerned with process management we will consider the role of a process manager in a little more detail. Figure 6.5 provides a very general overview of the role of a process manager. (Note that in Figure 6.4 we picture the process manager in a box outside the sales process. Earlier, in Figure 6.2 we pictured the process manager insider the process being managed. There is no correct way to do this and we do it differently, depending on what we are trying to emphasize.) This model could easily be generalized to serve as a high-level description of the job of any operational manager. This model could describe the job of the sales supervisor in Figure 5.4, for example. We'll talk about it, however, to provide a description of the various managerial activities as they relate to a core process. The key point to consider is that an organization is made up of processes, and for each process there must be someone who is responsible for the day-to-day functioning of that process. At lower levels within an organization the individual who is responsible might very well be a functional manager who is also wearing a process manager's hat. At higher levels in the organization, wearing two hats is harder because value chains and even large processes like new product development and supply chain often cut across functional boundaries.

Ignoring organizational issues for a moment, let's just consider what sort of work any process manager needs to accomplish. The process manager is responsible for what happens as the process is executed. He or she is also responsible for working with suppliers, customers, and support processes to ensure that the process he or she manages has the resources and support it needs to produce the product or

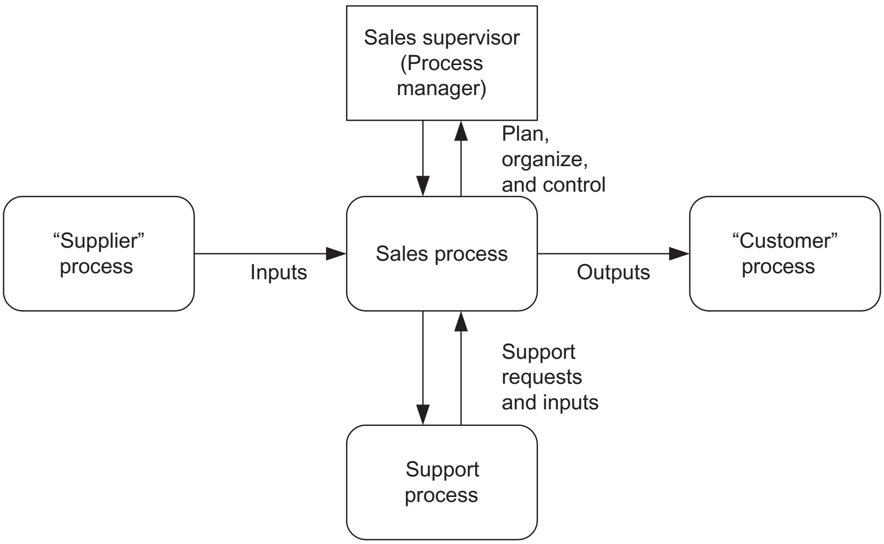


FIGURE 6.5

High-level overview of process management.

service the process's customer wants. When one approaches process management in this way, it is often unclear whether one is talking about a role, a process, or an individual. When you undertake specific process redesign projects you will often find yourself analyzing whether or not a specific process manager is performing in a reasonable manner. Things the specific individual does or doesn't do may result in process inefficiencies. When you focus on organization charts and managerial responsibilities you are usually focused on the role and seek to define who a specific manager would report to, without concerning yourself with the specific individual who might perform the role. Finally, when you focus on the competencies that a process manager should have to function effectively you are focusing on the managerial processes that successful individuals need to master if they are to perform the role effectively.

In Figure 6.6 we have expanded the process management box from Figure 6.5 and inserted some typical managerial processes. Different managerial theorists would

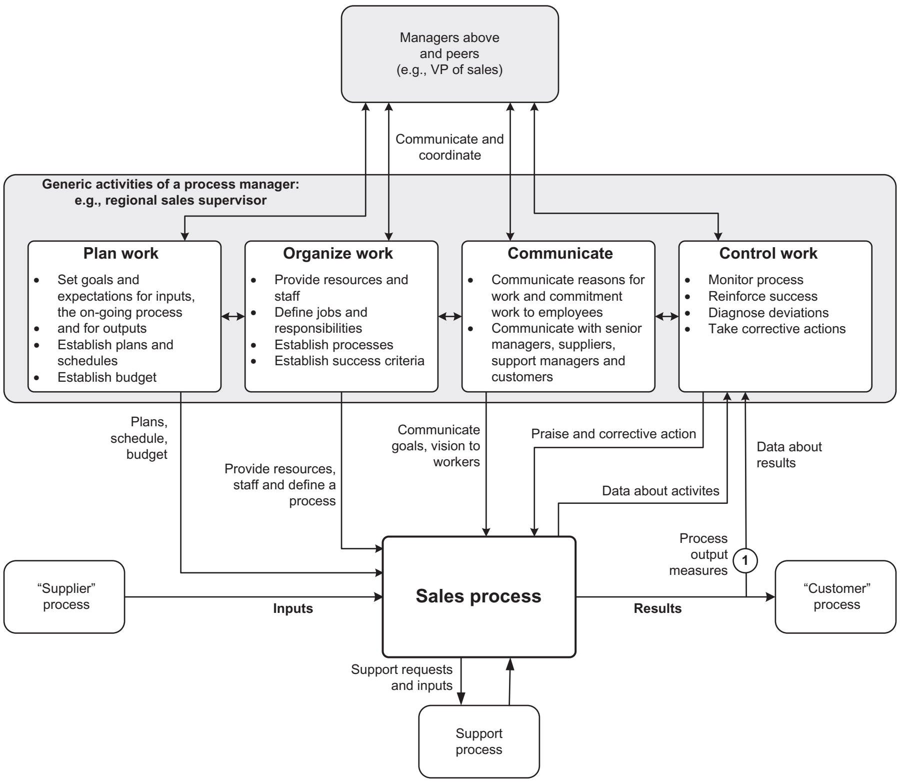


FIGURE 6.6

Overview of generic process management processes and subprocesses.

divide or clump the activities that we have placed in the four managerial processes in different ways. Our particular approach is simply one alternative. We divide the process management process into four generic subprocesses: one that plans, schedules, and budgets the work of the process; one that organizes the workflow of the process, arranges for needed resources, and defines jobs and success criteria; one that communicates with employees and others about the process; and one that monitors the work and takes action to ensure that the work meets established quality criteria. We have added a few arrows to suggest some of the main relations between the four management processes just described and the elements of the process that is being managed.

Most process managers are assigned to manage an existing process that is already organized and functioning. Thus their assignment does not require them to organize the process from scratch, but if they are wise they will immediately check the process to ensure that it is well organized and functioning smoothly. Similarly, if they inherit the process they will probably also inherit the quality and output measures established by their predecessor. If the new manager is smart he or she will reexamine all the assumptions to ensure that the process is in fact well organized, functioning smoothly, and generating the expected outcomes. If there is room for improvement the new manager should make a plan to improve the process. Once satisfied with the process the manager has some managerial activities that need to be performed on a day-to-day basis and others that need to be performed on a weekly, monthly, or quarterly basis. And then, of course, there are all the specific tasks that occur when one has to deal with the problems involved in hiring a new employee, firing an incompetent employee, and so forth.

Without going into details here, each process manager sometimes functions as if he or she were a process analyst, considering redesigning the process. All of the tools described in this book can be useful to a business manager when he or she is functioning in this role. In essence, the manager must understand the process and know how to make changes that will make the process more efficient and effective.

We'll consider the specific activities involved in process management in a later chapter when we consider how one approaches the analysis of process problems. At the enterprise level we will be more concerned with how companies establish process managers, how process managers relate to unit or functional managers, and how processes and process managers are evaluated.

Process managers, especially at the enterprise level, have a responsibility to see that all the processes in the organization work together to ensure that the value chain functions as efficiently as possible. While a functional manager would prefer to have all the processes within his or her department operate as efficiently as possible a process-focused manager is more concerned that all the processes in the value chain work well together and would in some cases allow the processes within one functional area to function in a suboptimal way to ensure that the value chain functions more efficiently. Thus, for example, there is a tradeoff between an efficient inventory system and a store that has in stock anything the customer might request.

To keep inventory costs down the inventory manager wants to minimize inventory. If that's done then it follows that customers will occasionally be disappointed when they ask for specific items and learn that they are not in stock. There is no technical way to resolve this conflict. It comes down to the strategy the company is pursuing. If the company is going to be the low-cost seller they have to keep their inventory costs down. If, on the other hand, the company wants to position itself as the place to come when you want it now they will have to charge a premium price and accept higher inventory costs. The process manager needs to understand the strategy the company is pursuing and then control the processes in the value chain to ensure the desired result. In most cases this will involve suboptimizing some departmental processes to make others perform as desired. This sets up a natural conflict between functional and process managers and can create problems when one manager tries to perform both roles.

If we had to choose the one thing that distinguishes a process manager from a functional manager it would be the process manager's concern for the way his or her process fits with other processes and contributes to the overall efficiency of the value chain. This is especially marked by the process manager's concern with the inputs to his or her process and with ensuring that the outputs of his or her process are what the downstream or "customer" process needs.

Functional or Process Management?

As we have already seen, at lower levels in the organization it's quite common for a single manager to function as both a unit and a process manager. At higher levels, however, it becomes harder to combine the two roles. Thus, when an organization considers its overall management organizational structure, the organization often debates the relative advantages of an emphasis on functional or process management. Figure 6.7 illustrates a simple organization that has two value chains, one that produces and sells widgets and another that sells a totally different type of product, smidgets. This makes it easy to see how the concerns of functional managers differ from process managers. The head of the sales department is interested in maintaining a sales organization. He or she hires salespeople according to sales criteria, trains salespeople, and evaluates them. Broadly, from the perspective of the head of sales, selling widgets and selling smidgets is the same process, and he wants to be sure that the selling process is implemented as efficiently as possible. The VP for the *widget* process, on the other hand, is concerned with the entire *widget* value chain and is primarily concerned that the *widget sales and service* processes work together smoothly to provide value to widget customers. The *widget* process manager would be happy to change the way the sales process functions if it would, in conjunction with the other *widget* processes, combine to provide better service to widget customers.

Thus, although it's possible for one individual to serve as both a unit and a process manager, it's a strain. Without some outside support from someone who emphasizes process it's almost impossible.

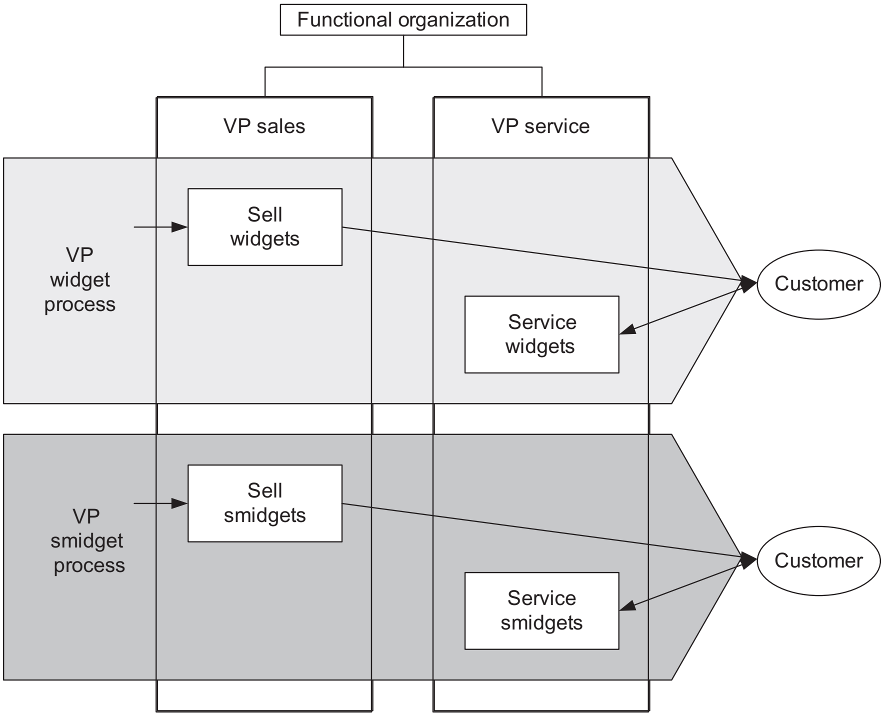


FIGURE 6.7

Different concerns of functional and process managers.

Matrix Management

Having defined functional and process management let's consider how an organization might combine the strengths of the two approaches at the top of the organization. Recently, leading organizations have begun to establish some kind of process management hierarchy that, at least at the upper level, is independent of the organization's functional hierarchy. The top position in a process hierarchy is a manager who is responsible for an entire value chain. Depending on the complexity of the organization the value chain manager might have other process managers reporting to him or her. This approach typically results in a matrix organization like the one pictured in Figure 6.8.

In Figure 6.8 we show a company like the one pictured earlier with three functional units. In this case, however, another senior manager has been added, and this individual is responsible for the success of the *widget* value chain. Different organizations allocate authority in different ways. For example, the *widget* process manager may function only in an advisory capacity. In this case he or she would convene meetings to discuss the flow of the Widget value chain. In such a situation

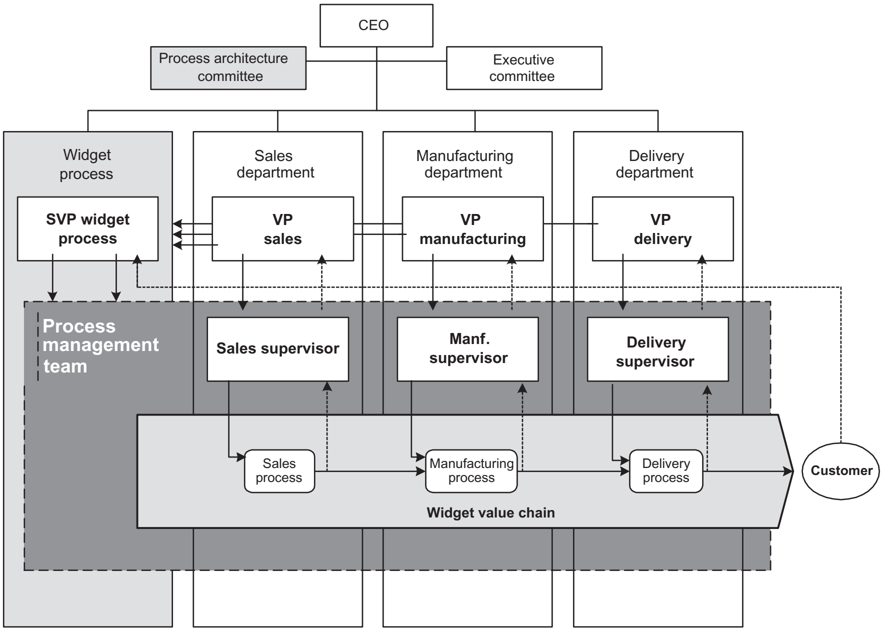


FIGURE 6.8

Matrix organization with independent senior functional and process managers.

the sales supervisor would still owe his or her primary allegiance to the VP of sales, and that individual would still be responsible for paying, evaluating, and promoting the sales supervisor. Key to making this approach work is to think of the management of the *widget* value chain as a team effort. In effect, each supervisor with management responsibility for a process that falls inside the *widget* value chain is a member of the *widget* value chain management team.

Other companies give the *widget* value chain manager more responsibility. In that case the sales supervisor might report to both the *widget* value chain manager and to the VP of sales. Each senior manager might contribute to the sales supervisor's evaluations and each might contribute to the individual's bonus, and so forth.

Figure 6.9 provides a continuum that is modified from one originally developed by the Project Management Institute (PMI). PMI proposed this continuum to contrast organizations that focused on functional structures and those that emphasized projects. We use it to compare functional and process organizations. In either case the area between the extremes describes the type of matrix organization that a given company might institute.

The type of matrix an organization has is determined by examining the authority and the resources that senior management allocates to specific managers. For example, in a weak matrix organization functional managers might actually "own" the employees, have full control over all budgets and employee incentives, and deal with all support organizations. In this situation the process manager would be little

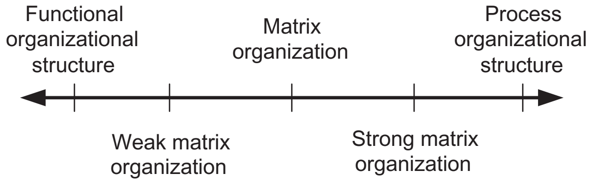


FIGURE 6.9

Types of organizational structure.

Modified from the Project Management Institute's classification of five organization types.

more than the team leader who gets team members to talk about problems and tries to resolve problems by means of persuasion.

In the opposite extreme the process manager might "own" the employees and control their salaries and incentives. In the middle, which is more typical, the departmental head would "own" the employees and have a budget for them. The process manager might have control of the budget for support processes, like IT, and have money to provide incentives for employees. In this case employee evaluations would be undertaken by both the departmental and the project manager, each using their own criteria.

Most organizations seem to be trying to establish a position in the middle of the continuum. They keep the functional or departmental units to oversee professional standards within disciplines and to manage personnel matters. Thus the VP of sales is probably responsible for hiring the sales supervisor shown in Figure 6.8 and for evaluating his or her performance and assigning raises and bonuses. The VP of sales is responsible for maintaining high sales standards within the organization. On the other hand, the ultimate evaluation of the sales supervisor comes from the SVP of the *widget* process. The sales supervisor is responsible for achieving results from the *widget sales* process and that is the ultimate basis for his or her evaluation. In a sense the heads of departments meet with the SVP of the *widget* process and form a high-level process management team.

Management of Outsourced Processes

The organization of managers is being complicated in many companies by outsourcing. Reconsider Figure 3.6 in which we described how Dell divides its core processes from those it outsources. Dell currently designs new computers that can be manufactured by readily available components. It markets its computers in a variety of ways and sells them by means of a website that lets users configure their own specific models. Once a customer has placed an order Dell transfers the information to an outsourcer in Asia. The components, created by still other outsourcers, are available in a warehouse owned and operated by the outsourcer, and the computers are assembled and then delivered by the outsourcer. If, after delivery, the computer needs repairs it is picked up by an outsourced delivery service and repaired in a warehouse operated by the outsourcer, then returned to the owner.

Leaving aside the issues involved in describing a value chain that are raised when a company outsources what have traditionally been considered core processes—Dell, after all, is usually classified as a computer equipment manufacturer—consider the management issues raised by this model. Dell isn't doing the manufacturing or the distribution. The outsourcer is managing both those processes with its own management team. On the other hand, Dell certainly needs to indirectly manage those processes, since its overall success depends on providing a customer with a computer within 2–3 days of taking the customer's order. In effect, Dell does not need to manage the traditional functional aspects of its PC/desktop-manufacturing process, but it does need to manage the process as a whole. This situation, and many variations on this theme, is driving the transition to more robust process management.

Value Chains and Process Standardization

One other trend in process management needs to be considered. When we discussed the types of alignment that companies might seek to document we mentioned that the identification of standard processes was a popular goal. In effect, if a company is doing the same activity in many different locations, it should consider doing them in the same way. A trivial example would be obtaining a credit card approval. This occurs when a customer submits a credit card and the salesperson proceeds to swipe it through a "reader" and then waits for approval and a sales slip to be printed. The flow we described depends on software that transmits information about the credit card to the credit card approval agency and returns the information needed to generate the sales slip. Doing this process in a standard way reduces employee training, simplifies reporting requirements, and makes it easier to move employees between different operations, all things that make the company more agile and efficient. Doing it with the same software reduces the need to develop or buy new software. If an enterprise resource planning (ERP) application is used, then a standardized process reduces the cost of updating the packaged software module and ensures that the same ERP module can be used everywhere credit card approval is undertaken.

Many companies installed ERP applications without first standardizing processes. This resulted in ERP modules that were tailored in different ways to support different specific processes. When the basic ERP module is updated this means that the new module has to be tailored again for each different specific process that it supports. If all the processes are standardized this will greatly reduce the cost of developing and maintaining the organization's ERP applications. Thus several large companies have launched programs designed to identify and standardize processes throughout the organizations.

Most companies, when they set about standardizing their processes, structure the effort by establishing a process management organizational structure. Thus they create a matrix organization and assign individuals to manage "standard process areas." These individuals (process managers) are then asked to look across all the departments in the firm and identify all the places where activities are undertaken that might be standardized. Figure 6.10 shows the matrix developed in the course of one such effort.

In Figure 6.10 we have turned the traditional functional organization on its side, so that the company's divisions and departments run from left to right. Across the top we picture the process managers and show how their concerns cut across all the divisions and departments. At first glance this might seem like a matrix organization that organizes around functional units and processes. Consider, however, that the company has more than one value chain. One division sells commodity items to hospitals while another builds refinery plants, which it then sells to other organizations. These activities are so different that they have to be separate value chains. If we are to follow Porter and Rummler we will seek to integrate all the processes within a single value chain around a single strategy to ensure that the value chain as a whole is as efficient as possible. To achieve this the ultimate process manager is the manager responsible for the entire value chain. In the example shown in Figure 6.10 the division manager responsible for the customer refinery engineering division is better positioned to pursue that goal than the sales process manager. Similarly, the division manager responsible for hospital products is better positioned to optimize the hospital product value chain than the sales process manager.

The sales process manager in Figure 6.10 is well positioned to examine all the sales processes in all the divisions and departments and find common processes. The

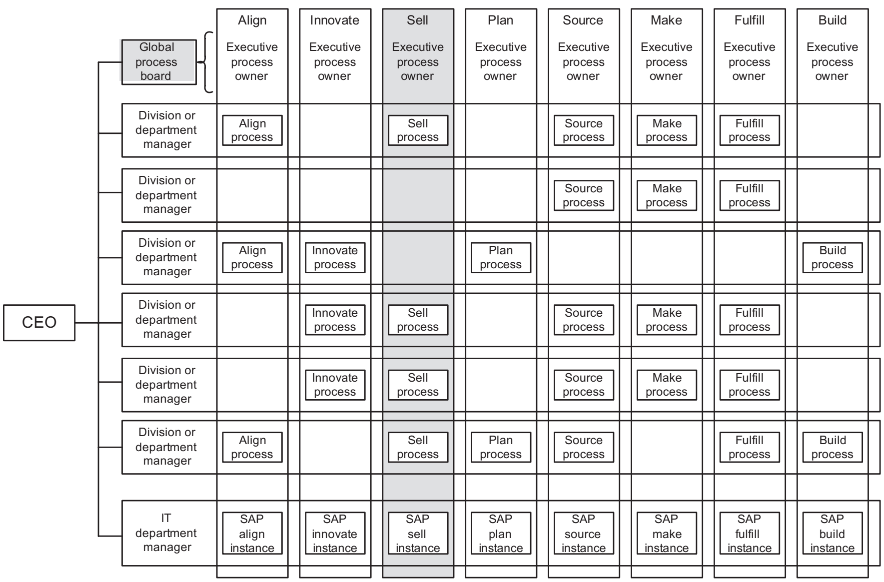


FIGURE 6.10

Matrix organization.

company's goal in creating this matrix was to standardize their ERP applications. If the process manager is careful and focuses on lower level processes, like credit card approval, then he or she will probably be able to identify several processes that can be usefully standardized. On the other hand, if the sales process manager seeks to standardize the overall sales processes he or she runs the risk of suboptimizing all the value chains. It's to avoid this situation that we recommend beginning by identifying the organization's value chains and then organizing process work around specific value chains. We certainly understand the value in identifying standard processes that can be automated by standard software modules, but it is an effort that needs to be subordinated to the goal of optimizing and integrating the organization's value chains. Otherwise this becomes an exercise in what Porter terms operational effectiveness—a variation on the best practices approach—that seeks to improve specific activities without worrying about how they fit together with other activities to create a value chain that will give the company a long-term competitive advantage.

Setting Goals and Establishing Rewards for Managers

Managers, like everyone else, need to have goals to focus their efforts. Moreover, in business situations managers will predictably try to accomplish the goals they are rewarded for achieving. Rewards can take many forms: being told that you did a good job, getting a raise, knowing you are likely to get promoted, or receiving a significant bonus. The key point, however, is that a well-run organization sets clear goals for its managers and rewards effective performance. If the goals aren't clear, or if a given manager is asked to simultaneously pursue multiple, conflicting goals, then suboptimal performance will invariably result. In examining defective processes it is common to find managers who are being rewarded for activities that are detrimental to the success of the process. This sounds absurd, but it is so common that experienced process analysts always check for it.

Does the organization really want more sales, and does it motivate the sales manager in every way it can? Or does it want sales reports turned in on time, and does it reward the sales manager who always gets his or her reports in on time while criticizing the sales manager who achieves more sales for failing to submit the reports? We remember working on a call center process where the management wanted the agents to try to cross-sell hotel stays to people who called to ask about airline flights. One group worried that, despite training and posters in the call center, few hotel stays were being sold. A closer examination showed that the call center supervisor was rewarded for keeping the number of operators at a minimum. That was achieved by keeping each phone call as short as possible. The time operators talked to customers was carefully recorded, and operators who handled more calls in any given period were rewarded and praised. Those who spent more time on their calls—trying to sell hotel stays, for example—were criticized. There were no compensating rewards for selling hotel stays, so predictably no hotel stays were being sold.

When we consider the analysis of specific processes we will see that it is important to carefully analyze each manager's goals and motivation. If a process is to succeed, then we need to be sure the manager's goals and rewards are in line with the goals of the process. Thus, just as it is important to have a management system that focuses on integrating and managing processes, it is important to see that there is a system for aligning the goals and rewards given to specific managers with the goals of the processes that they manage. We'll consider performance measurement and then return to a discussion of how an organization can align measurement and manager evaluation.

Management Processes

A company could analyze each manager's work from scratch using our generic management model. Increasingly, however, companies find it more efficient to rely on one or more generic models that help analysts identify the specific management processes that effective process managers need to master. Let's quickly review some of the frameworks and maturity models that are currently popular. We'll start with the PMI Project Management Maturity Model and then consider the Software Engineering Institute's (SEI) Capability Maturity Model Integrated (CMMI) model, the Supply Chain Council's (SCC) Supply Chain Operations Reference (SCOR) business framework, and the IT Governance Institute's (ITGI) COBIT (control objectives for information and related technology) framework.

PMI's Project Management Maturity Model

PMI distinguishes between operations management (ongoing) and project management (done in a limited timeframe). They describe a body of knowledge about project management (PMBOK) and an Organizational Project Management Maturity Model (OPM3) that organizations can use to (1) evaluate their current sophistication in managing projects and then use as (2) a methodology for introducing more sophisticated project management skills. In their PMBOK and in the OPM3 they assume that there are five management processes that every project manager must learn. They include (1) initiating, (2) planning, (3) executing, (4) monitoring and controlling, and (5) closing. Figure 6.11 suggests how the skills involved in each of these processes map to our general overview of management.

Our general model of management (Figure 6.6) pictures an operational management role and describes the activities that a process manager must perform. Project management extends that by adding a process for defining the nature of the specific project to be managed (*initiating*) and another that critiques the project and pulls together things that were learned in the course of the project (*closing*).

SEI's CMMI Model

The best known of all the process maturity models is the SEI's CMMI, which we discussed in some detail in the Introduction. Although CMM was originally developed to evaluate IT departments, the extended version CMMI is designed to help companies evaluate and improve any type of business process. CMMI supports

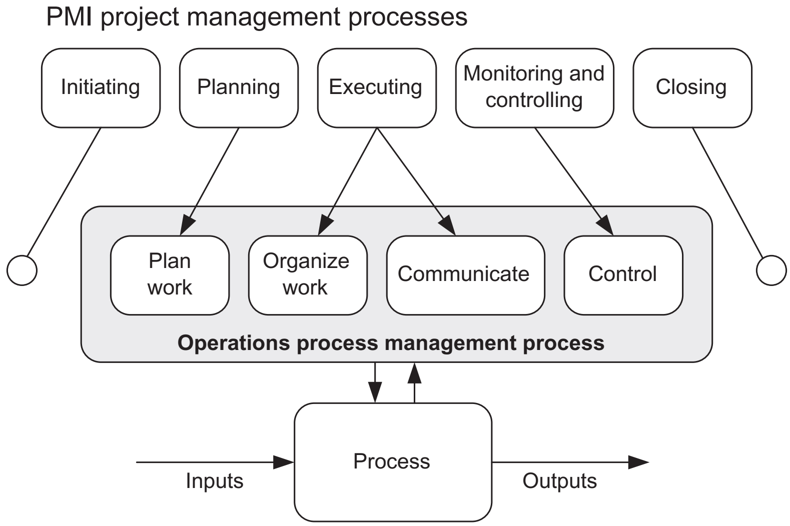


FIGURE 6.11

How the Project Management Institute's management processes map to our generic Process Management Model.

two ways of organizing your effort. You can either analyze the capabilities of a given department or group of practitioners or you can focus on the overall maturity of an organization. The first, which focuses on capability levels, looks to see what skills are present and then focuses on teaching managers or process practitioners the skills that are missing. The second, which focuses on maturity levels, assumes that organizations become more process savvy in a systematic, staged manner and focuses on identifying the state the organization is at now and then providing the skills the organization needs to move to the next higher stage. Obviously, if you focus on organizational maturity, then CMMI functions as an enterprise process improvement methodology that provides a prescription for a sequence of process-training courses designed to provide process managers with the skills they need to manage their process more effectively. If you focus on the individual work unit and emphasize capabilities, then CMMI provides a set of criteria to use to evaluate how sophisticated specific process managers are and to determine what management processes they need to master to more effectively manage the specific process you are trying to improve.

No matter which approach you use, once the basic evaluation is complete the focus is on either the management processes that need to be acquired by the organization's managers or on the activities needed by individuals who are responsible for improving the organization's existing processes.

Although CMMI doesn't place as much emphasis on types of management as we might one way they organize their processes is based on the type of manager who will need to master the process. Thus they define some management processes for operations managers (which they term process management), a second set of processes for project managers, and a third set for engineering and support managers who manage enabling or support processes. Figure 6.12 shows how CMMI would define the various management processes and shows at what organizational maturity level company managers would normally require the ability to use those processes. It will help to understand the CMMI classification if you keep in mind that day-to-day operational managers need to manage routine improvements in processes, but that major changes are undertaken as projects and that a business process management group that maintained an architecture or provided process consultants (black belts) to a specific project effort would be a support group. Put a different way, CMMI's focus is on improving processes, but their major assumption is that processes are improved as they are defined, executed consistently, measured, and as a result of measurement systematically improved. Ultimately, putting these elements in place and executing them on a day-to-day basis is the responsibility of the individual who is managing the process.

Here are the definitions that CMMI provides for its process management "process areas":

- *OPD—Organizational process definitions process*. Establish and maintain a usable set of organization process assets and work environment standards.

Process areas that support CMMI maturity levels		Four management areas defined by CMMI			
		Project management Project mang.	**Process management** Operations mang.	**Engineering** Support proc. mang.	**Support** Support proc. mang.
Level 5. Optimizing	Focus on continuous process improvement		OID-organizational innovation and deployment		CAR-causal analysis and resolution
Level 4. Managed	Process measured and controlled	QPM-quantitative project management	OPP-organizational process performance		
Level 3. Defined	Process characterized for the organization and is proactive.	RSKM-risk management IPPD-integrated project management	OT-organizational training OPF-organizational process focus OPD-organizational process definition	VAL-validation VER-verification PI-product integration TS-technical solution RD-requirements development	DAR-decision analysis and resolution
Level 2. Repeatable	Process characterized for projects and is often reactive.	SAM-supplier agreement management PMC-project monitoring and control PP-project planning		RM-requirements management	MA-measurement and analysis PPQA-process and product quality assurance CM-configuration management
Level 1. Initial	Processes unpredictable, poorly controlled, and reactive.				
		Project management	**Process management**	**Engineering**	**Support**

FIGURE 6.12

Capability Maturity Model Integrated model's management processes, arranged by management type and organizational maturity level.

- *OPF—Organizational process focus process*. Plan, implement, and deploy organizational process improvements based on a thorough understanding of the current strengths and weaknesses of the organization's processes and process assets.
- *OT—Organizational training process*. Provide employees with the skills and knowledge needed to perform their roles effectively and efficiently. It includes identifying the training needed by the organization, obtaining and providing training to address those needs, establishing and maintaining training capability, establishing and maintaining training records, and assessing training effectiveness.
- *OPP—Organizational process performance process*. Establish and maintain quantitative understanding of the performance of the organization's set of standard processes in support of quality and process performance objectives, and to provide process performance data, baselines, and models to quantitatively manage the organization's projects.
- *OID—Organizational innovation and deployment process*. Select and deploy incremental and innovative improvements that measurably improve the organization's processes and technologies.

If we were to map this particular subset of operational management processes to our general process management model (Figure 6.6) it would look something like what we picture in Figure 6.13. We placed numbers in front of the processes to suggest that at maturity Level 3 a manager would be expected to have the capabilities

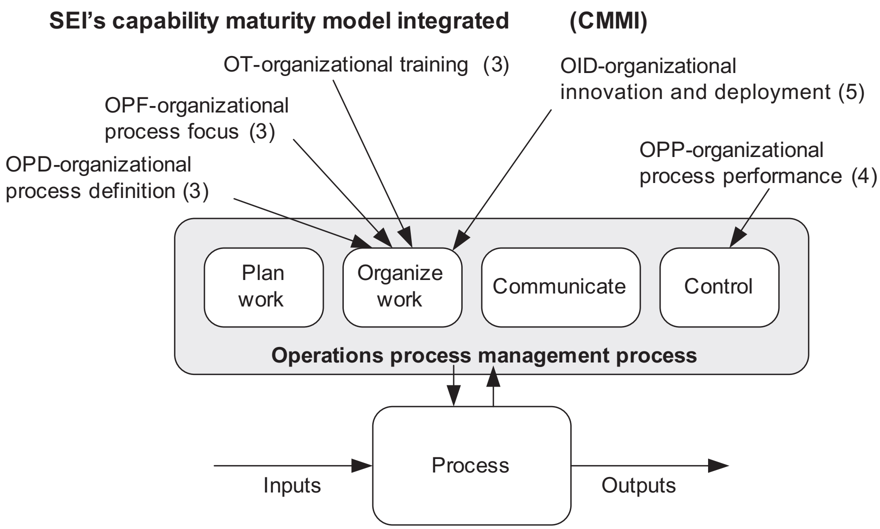


FIGURE 6.13

How the Capability Maturity Model Integrated model's management processes map to our generic Process Management Model.

identified as (3). As the individual or organization matured and reached Level 4 you would assume the manager had mastered the (4) processes and at Level 5 he or she would have mastered the (5) processes.

SCC's SCOR Framework

The SCC is primarily focused on defining the core processes that make up a supply chain system. At the same time, however, they have a generic process called *plan*. For each supply chain process, such as *source*, *make*, *deliver*, or *return*, they require the modeler to add a *plan* process. In fact, they require a hierarchy of *plan* processes, in effect creating a picture of the process management effort required for a supply chain process. Figure 6.14 shows how SCOR analysts would model a simple supply chain. To simplify things we only show *plan* processes for the top row of processes. Within Alpha there are two departments, which are separated by the dashed line. Within each department there are source, make, and deliver processes. There is one *plan* process for each. In addition, there is one *plan* process for all of the *plan source*, *plan make*, and *plan deliver* processes within a given department.

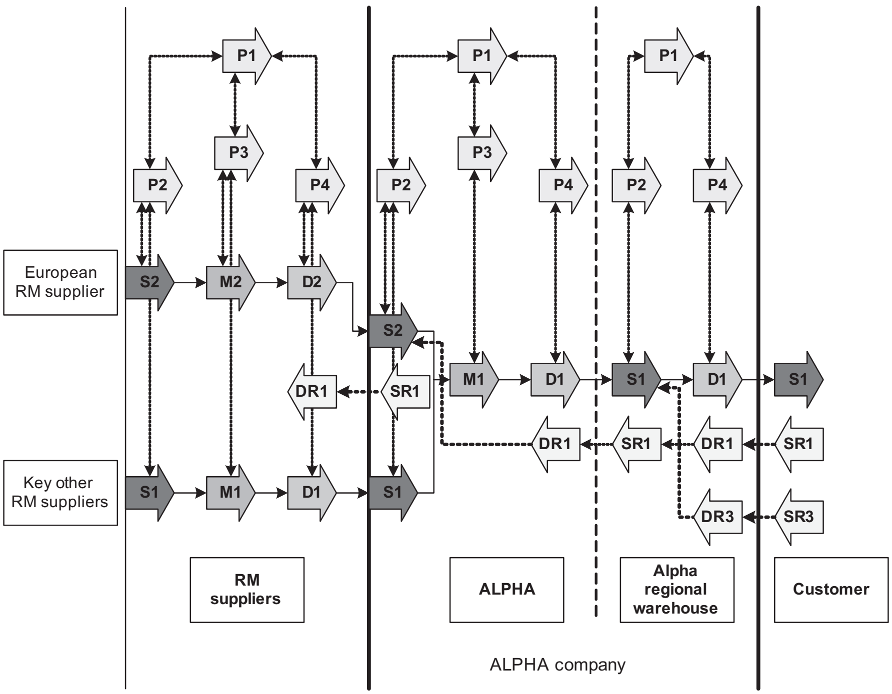


FIGURE 6.14

Supply Chain Operations Reference thread diagram showing the operational and management processes in a supply chain.

The SCC defines four subprocesses for their *plan* process, which vary slightly depending on the core process they are supporting. The *plan make* subprocesses include:

- PM1 Identify, Prioritize, and Aggregate Production Requirements
- PM2 Identify, Assess, and Assign Production Resources
- PM3 Balance Product Resources and Requirements
- PM4 Establish Production Plans

Although they don't picture the processes on their thread diagrams the SCC's SCOR framework also defines an *enable* process and then defines *enable* subprocesses. Here are the eight *enable make* subprocesses:

- EM1 Manage Production Rules
- EM2 Manage Production Performance
- EM3 Manage Production Data
- EM4 Manage In-Process Production Inventory
- EM5 Manage Equipment and Facilities
- EM6 Manage Make Transportation
- EM7 Manage Production Network
- EM8 Manage Production Regulatory Compliance

The subprocess list reflects the more specialized role of the supply chain manager. In addition, while a lower level *make* process manager might not be concerned with some of these subprocesses, higher level supply chain managers would and this reflects the fact that SCOR describes not only the work of the immediate managers of a process but also considers the work that the manager's boss will need to do.

The SCC decided to focus on management processes that are more knowledge intensive and thus didn't include things like assigning people to tasks, monitoring output, or providing employees with feedback. An overview of how the SCOR management processes map to our general process management model (Figure 6.6) is presented in Figure 6.15.

The ITGI's COBIT Framework

ITGI developed their process framework to organize the management of IT processes. Their high-level IT management processes map easily to our general management model (see Figure 6.16).

ITGI has defined subprocesses for each of their processes and the subprocesses also reflect our general model. Thus, for example, the ITGI subprocesses for *plan and organize* (PO) include:

- PO1 Define a Strategic IT Plan
- PO2 Define an IT Architecture
- PO3 Define Technical Direction
- PO4 Define IT Processes, Organization, and Relationships

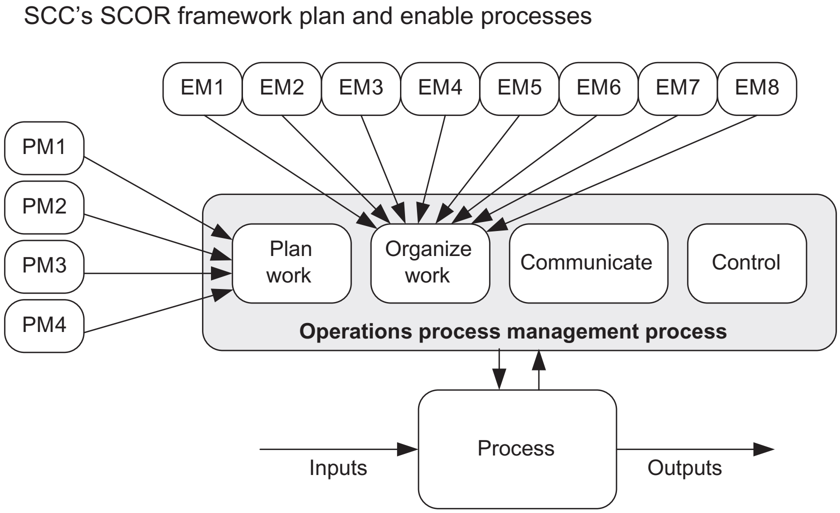


FIGURE 6.15

How the Supply Chain Operations Reference *plan and enable* management processes for the *make* process map to our generic Process Management Model.

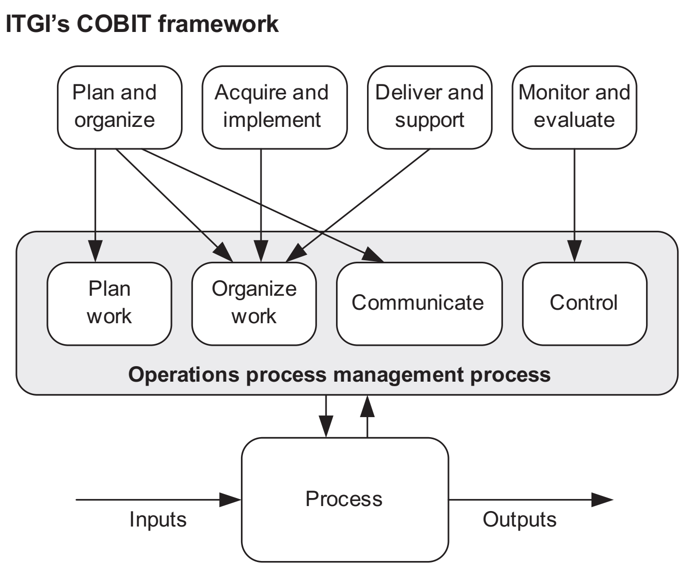


FIGURE 6.16

How the IT Governance Institute's COBIT management processes map to our generic Process Management Model.

- PO5 Manage IT Investment
- PO6 Communicate Management Aims and Directions
- PO7 Manage IT Human Resources
- PO8 Manage Quality
- PO9 Manage Projects

As we look at the subprocesses we realize that the COBIT management processes are more appropriate for a CIO or a senior IT manager and not for the manager of maintain ERP applications, let alone the manager of the process to maintain ERP for accounting.

On the other hand, a review of the COBIT documentation shows that COBIT not only defines high-level IT management processes, but also defines goals for the IT organization as a whole, and then shows how different IT management processes can be linked to IT goals and proceeds to define metrics for each management process.

We have not gone into any of the various process management frameworks in any detail. For our purposes it suffices that readers should know that lots of different groups are working to define the processes that managers use when they manage specific processes. Some groups have focused on the activities, skills, and processes that a manager would need to manage an ongoing process, and others have focused on the activities, skills, and processes a manager would need to manage a project. Some have focused on the activities of senior process managers, and others have focused on managers who are responsible for very specific core processes. As we suggested earlier, defining process management is hard. Different people have pursued alternative approaches. Some simply diagnose what specific managers are doing wrong as they look for ways to improve the performance of a defective process. Others focus on the actual processes and activities that effective managers need to master to plan, organize, communicate, and monitor and control the process they are responsible for managing. Organizations that focus on managerial processes usually tend to establish process management–training programs to help their managers acquire the skills they need to perform better.

Documenting Management Processes in an Architecture

Most organizations do not document management process in their formal business process architecture. If you think of every operational process as always having an associated management process, then it seems unnecessary to document the management processes. If day-to-day management processes are documented they are usually done so as generic, standard processes that it is assumed every manager will use. If this is the company approach, then using one of the frameworks described as a source of information and definitions is a reasonable way to proceed. Most organizations identify high-level management processes that are independent of any specific value chain, and document them independently. Thus, an organization might document the strategy formulation process or the processes of a business process management support group. Others treat these specialized processes as support processes and document them in the same way they document other support processes. However your company decides to approach documentation the management processes describe sets of activities that process managers ought to master, and thus they should provide a good basis for a process manager training program.

Completing the Business Process Architecture Worksheet

Recall that the Level 1 architecture analysis worksheet provides a space at the top for the name of the manager of the value chain (see Figure 4.2). Then, below, you were asked to enter each Level 1 process, and identify the manager for each of the Level 1 processes. Then you were asked to complete a worksheet for each Level 1 process on which you listed the Level 2 processes that make up the Level 1 process, and you were asked to identify the managers responsible for each Level 2 process. In our experience most companies can identify the managers of their Level 2 or Level 3 processes without too much trouble. They have problems with identifying the managers responsible for the value chains and for the Level 1 processes. If you recall our sales supervisor in Figure 6.8, that individual was both a unit manager and a process manager, and he or she would be easy to identify in most organizations. It's the process manager who is responsible for processes that cross the traditional boundaries that are harder to identify. In many cases they don't exist. Yet they are the only managers who can ensure that your organization's large-scale processes work as they should. They are the managers who focus on integrating the entire value chain and aligning the value chain with your organization's strategy. They are the managers who are really focused on the value chain's external measures and satisfying the customer. Most organizations are just beginning to sort through how they will manage processes at the higher levels of the organization, yet it is at these levels that huge gains are to be made and that competitive advantage is to be achieved. Ultimately, this is the work of the senior executives of your organization. If they believe in process, then this is a challenge they must address.

Notes and References

There are so many ways of classifying the basic tasks a manager must perform. I worked for a while for Louis Allen and became very familiar with his system. I've certainly studied Drucker, and my personal favorite is Mintzberg. And, of course, I've studied Geary Rummler's papers on process management. They all segment the tasks slightly differently, but the key point is that managers undertake activities to facilitate and control the work of others.

Drucker, Peter F., *Management: Tasks, Responsibilities, Practices*, Collins, 1993.

Allen, Louis A., *Principles of Professional Management* (2nd ed.), Louis Allen Associates 1978. In the mid-1970s I worked briefly for Louis A. Allen, a then-popular management consultant. As far as I know, his books are no longer in print, but he introduced me to the idea that managers must plan, organize, lead, and control. I've simplified that in this chapter to planning and controlling.

Mintzberg, Henry, *The Nature of Managerial Work*, Prentice Hall, 1973.

A lot of companies tried matrix management in the 1970s and found it too difficult to coordinate, and dropped it. Most companies are doing it today—individual managers are reporting to more than one boss—but no one seems to want to call it matrix management. But there doesn't seem to be any other popular name for the practice, so I've termed it matrix management.

PMI has developed an excellent framework for project management. We rely on them for their description of organizational structure, which they suggest ranges from functional to project management, with stages of matrix management in between. And we also discuss their PMI Management Maturity Model. More information is available at http://www.pmi.org. The best book for a general description of their maturity model is Bolles, Dennis L., and Darrel G. Hubbard, *The Power of Enterprise-Wide Project Management*, AMACOM, 2007.

Ahem, Dennis M., Aaron Clouse, and Richard Turner, *CMMI Distilled: A Practical Introduction to Integrated Process Improvement* (2nd ed.), Addison-Wesley, 2004. This book is the best general introduction to CMMI management processes. More information on CMMI is available at http://www.sei.cmu.edu.

Information about how the SCC's SCOR defines *plan and enable* processes is available at http://www.supply-chain.org.

Information about ITGI's COBIT framework is available at http://www.itgi.org.

There are other business process theorists who have focused on improving the management of processes. Three of the best are:

Champy, James, *Reengineering Management*, HarperBusiness, 1995. As with the original reengineering book this is more about why you should do it than how to do it.

Hammer, Michael, *Beyond Reengineering: How the Process-Centered Organization Is Changing Our Work and Our Lives*, HarperBusiness, 1997. Similar to the Champy book. Lots of inspiring stories.

Spanyi, Andrew, *More for Less: The Power of Process Management*, Meghan-Kiffer, 2006. This is a good, up-to-date discussion of the issues involved in managing processes from an enterprise perspective.

Information on the Chevron process management improvement effort is documented in a white paper: "Strategic Planning Helps Chevron's E&P Optimize Its Assets," which is available at http://www.pritchettnet.com/COmp/PI/CaseStudies/chevroncase.htm.

CHAPTER

An executive-level business process management group 7

Organizations have different ways of managing their business process efforts, and there is no one best way. It largely depends on how an organization is already structured. Some organizations have a group charged with working on enterprise strategy. Others have an executive committee that defines enterprise strategy. Others treat it as a special project headed by the CEO. Similarly, different organizations handle the overall management of their process work in different ways. In its latest survey (2016) BPTrends found that about 32% of the companies surveyed did not have a formal business process management (BPM) group; 19% had BPM groups that were located within divisions or reported to department managers; 15% had a BPM group that reported at the executive level; and 21% had a BPM group located in their IT organization. Obviously, the location of a BPM group or center of excellence says a lot about the goals of the organization and their interest in business process. Organizations that think of BPM as an automation initiative would be more likely to delegate it to the IT organization. Organizations that are focused on the redesign or improvement of specific business processes are more likely to locate their process groups in divisions or departments. Organizations that are focused on enterprise issues and think of processes and process management as strategic resources that need to be aligned with corporate strategy and company-wide performance measures will tend to locate their BPM group at the enterprise level, just as they locate their strategy group at the enterprise level. In a similar way, the name that companies apply to the group tends to reflect their objectives. A BPM group reflects an emphasis on management. A *process excellence* group suggests process redesign and improvement projects, and a *business process automation* group suggests an IT emphasis.

In this chapter we will focus on the types of activities that an enterprise BPM group might manage. Then, we will consider how Boeing Global Mobility Systems (GMS) has organized an entire business unit around processes and see how the *process management* group at Boeing GMS plays a key, coordinating role.

What Does a BPM Group Do?

Different companies assign different sorts of responsibilities to their BPM groups. In Figure 7.1 we provide an overview of the various types of activities that a BPM group might be responsible for creating, managing, or maintaining. We suggest inputs to the various BPM groups' processes on the left and outputs a group might generate on

Business Process Change. https://doi.org/10.1016/B978-0-12-815847-0.00007-8

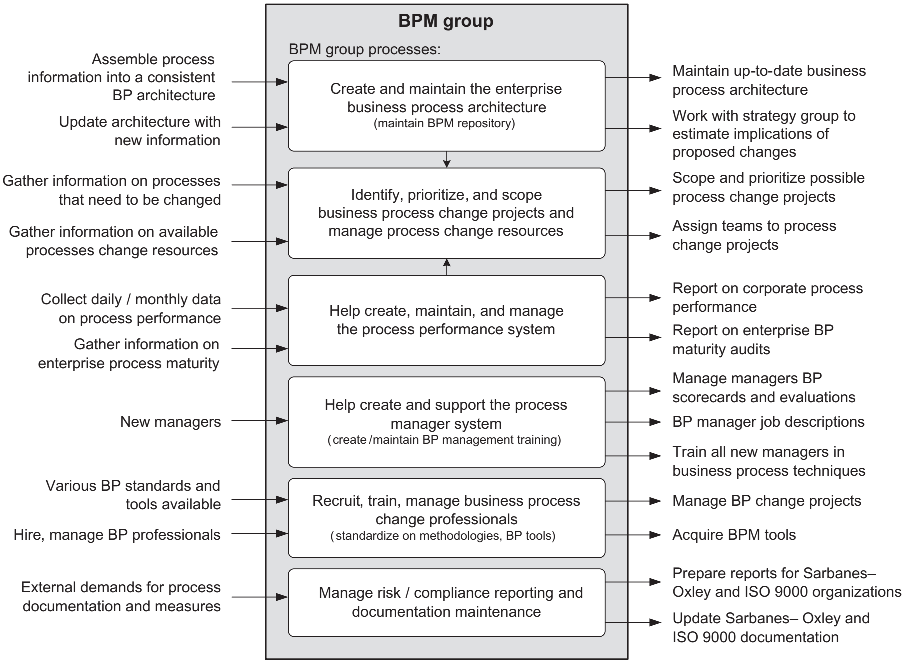


FIGURE 7.1

Processes a business process management group might manage.

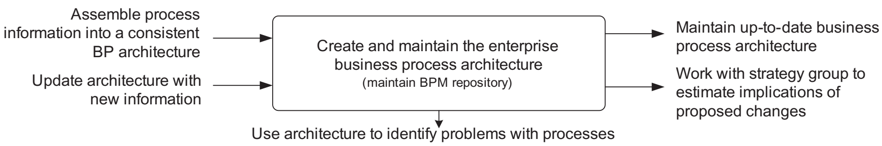


FIGURE 7.2

Create and maintain a business process architecture process.

the right. Most BPM groups will support fewer processes, and almost all will have the processes subdivided into different processes, but this will provide a basis for a discussion of the kinds of things that a BPM group might do. We'll consider each BPM group process in turn (Figure 7.2).

Create and Maintain the Enterprise Business Process Architecture

Any organization that wants to exert systematic, ongoing control over its processes needs to understand exactly what processes it has. We have already discussed this in Chapter 3. The business process architecture in question can be a minimal architecture that simply identifies the major value chains and key processes and the relationships between them, or it can be a more detailed architecture that defines processes, managers, measures, links to strategies and policies, links to IT resources, links to training resources, and so forth. The more elaborate the process architecture, the more valuable it will be as a senior management tool, but only if it is up to date. Any organization that is serious about maintaining a large, detailed, business process architecture will need to maintain it in a database (or repository) that will make it easy to maintain a large amount of information, to identify linkages among the architectural elements, and, very importantly, to constantly update the information.

A BPM group with an up-to-date business process architecture stored in a repository is well positioned to provide a variety of management support tasks. For example, the US government, via the Sarbanes-Oxley legislation, recently asked all US firms to submit reports proving they could monitor key financial decision points. Companies without a business process architecture spent anywhere from a year to 3 years struggling to analyze their decision flows and developing the means to comply with the required Sarbanes-Oxley reporting. Leading firms with an existing business process architecture simply created a Sarbanes-Oxley reporting form and used their existing business process repository to populate the form they needed to submit. In other words, companies with comprehensive business process architectures already understood their processes and had the data required, and it was only a matter of creating a report generation procedure to pull the data from the repository and put it into the form the US government required.

An up-to-date business process architecture allows the members of a BPM group to quickly define the impact of proposed changes. Since a well-defined architecture defines the relationships between processes and subprocesses and between processes and IT resources and training resources, among other things, the BPM group can quickly project what a specific business process change will require in the way of changes to IT or training. Thus, the creation of a business process architecture provides the organization with a key tool to ensure the organization's continuing agility and its ability to deal with change in a rapid and efficient manner. The BPM group should maintain a close relationship with the organization's strategy group, providing it with process performance data and advice on the opportunities or problems involved in adapting to new strategic directions. If the architecture is well defined and up to date the BPM group ought to be able to quickly define all the core and support processes that would need to be changed to implement any specific strategic change.

Finally, an up-to-date business process architecture becomes the central tool that a process-oriented company uses to identify needs for process changes.

Identify, Prioritize, and Scope Business Process Change Projects

Using inputs from operations managers, from the strategy committee, from those working with the business process architecture and those maintaining the process performance system the BPM group is in a position to determine what processes need to be changed. In most large organizations there are more processes requiring change than resources to undertake process change projects. In many organizations process change projects are initiated by different groups without coordination. A major advantage of a BPM group ought to be oversight and prioritization of all process change projects. This will occur only if senior management requires everyone to work with the BPM group to schedule a process change project.

Even in a large organization there is a limit on the amount of disruption the organization can handle at any one time. Thus usually an organization should only attempt one or two really major redesign projects at any given time. The same organization might still undertake several midsize projects and be quite capable of undertaking a large number of small process improvement projects at the same time.

The BPM group should maintain an overview of all processes that require changes, and define the project scope for each possible change project. (We will consider how to scope a process change project in Chapter 8 in more detail.) This document should allow the BPM group to determine the overall scope of the effort and to determine what resources will be required. By maintaining a close relationship with the strategy group and with senior management the BPM group should be able to assign a priority to any specific process change project.

Obviously, the priorities and the schedule need to be reviewed on a monthly basis and changes made to reflect changes in the organization's goals. Figure 7.3 provides a high-level description of a process that analyzes process problems and available resources and defines, prioritizes, and assigns business process change projects.

Figure 7.4 provides one way that a BPM group might begin to develop an overview of the opportunities the organization has for process improvement. In this case the BPM group has used an organization diagram that shows how the organization relates to the outside environment. As the team has examined the various relationships, probably in conjunction with the strategy team, they have noticed various threats or opportunities that need to be addressed. Using this or a similar technique the BPM group can maintain an enterprise-wide overview of major process change opportunities.

Figure 7.5 shows how an organization diagram could be used to review the various stakeholders who have an interest in an organization. Stakeholders are simply people who care about and exert influence over the company, its processes, and its products. Value chains have stakeholders, and specific processes have stakeholders. One can assume that the goal of a process is to satisfy the customers of the process.

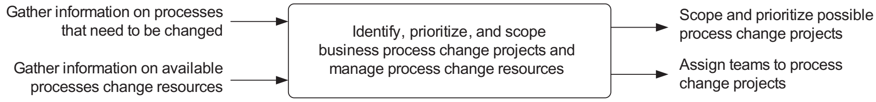


FIGURE 7.3

Identify, prioritize, and scope BP change projects process.

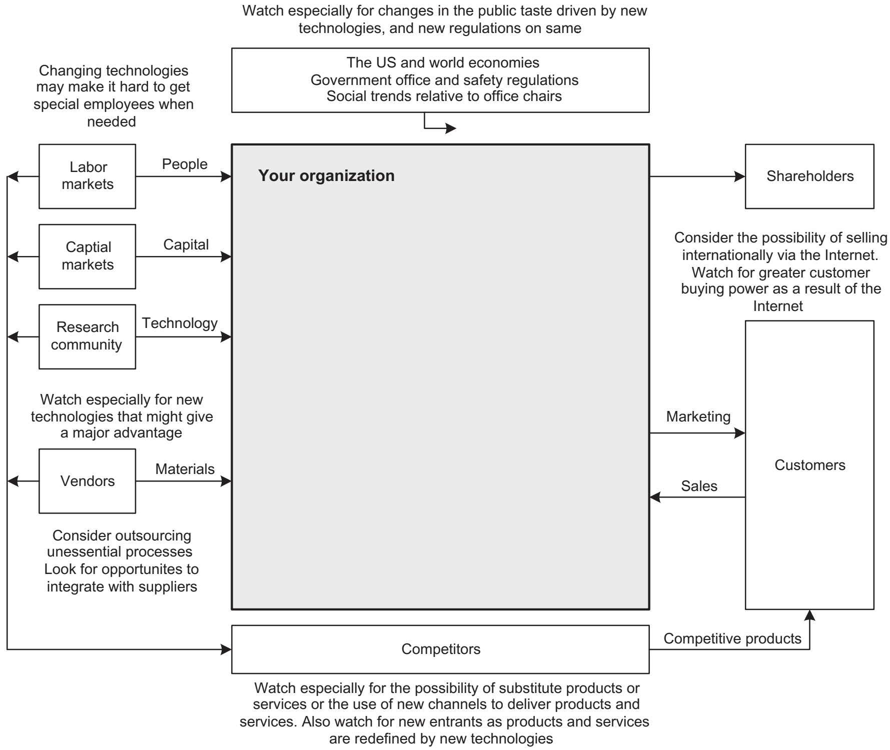


FIGURE 7.4

Analysis of organization threats and opportunities using an organization diagram.

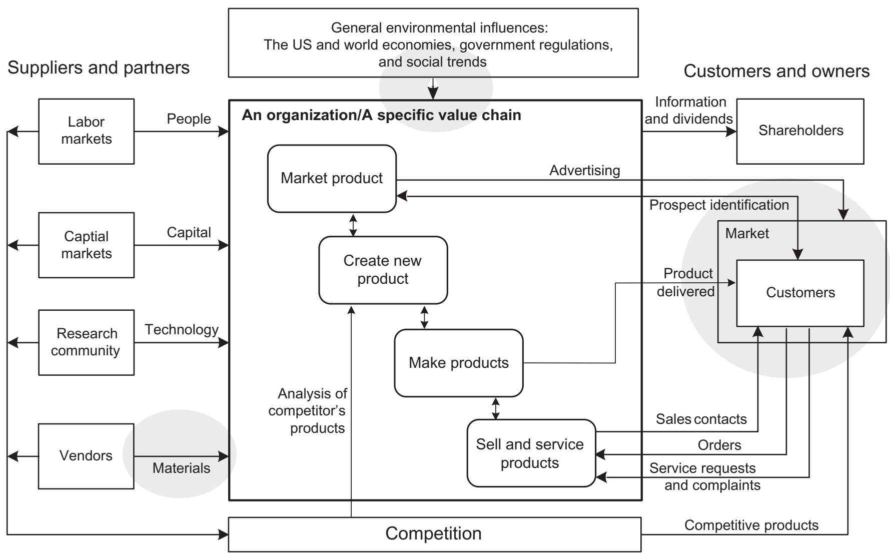


FIGURE 7.5

Organization diagram with some key stakeholder relationships highlighted.

As a first approximation, that's true since the customers of processes are usually the major stakeholders. Other obvious stakeholders include:

- Owners (shareholders)
- Employees
- Managers
- Partners
- Suppliers
- Government (legal, regulatory)
- Public
- Competitors

When you want to determine if a process is functioning correctly you should develop a list of stakeholders and check what each one expects from the process and how the process would need to be changed to satisfy that particular stakeholder. In Figure 7.5 we are looking at an entire value chain, and have highlighted three possible stakeholders for the generic value chain pictured within the organization box.

Most BPM groups that are prioritizing processes will work with the business process architecture team to be sure they know everything they can about a process before determining if the process needs to be changed, and if it does what priority should be assigned to a particular process change.

Assuming that the BPM group controls or coordinates the various process change resources in the organization it is also in a good position to determine what resources are available and to schedule specific process change projects. Today there are lots of different approaches one can take to improve the performance of a company's business processes. Without trying to exhaust the list, here are some of the major options:

- *Redesign*. This is a major analysis of the existing process followed by a redesign effort that should significantly improve the process. This kind of effort typically results in changed job descriptions and the introduction of some automation. This type of effort is usually undertaken by business process redesign consultants from inside or outside the company.
- *Automation*. This can be used in conjunction with process redesign, or it can be an independent effort to automate a specific process or activity. This type of effort is usually undertaken by the IT group within the organization or by an outside IT group. There are different techniques available, including packaged applications, such as enterprise resource planning (ERP) and customer resource management (CRM), or software specially developed by an internal or external IT group.
- *Improvement*. This is a more focused effort aimed at incrementally improving an existing process. This can be an effort a process manager undertakes, or an effort undertaken by a Lean or Six Sigma improvement team.

- *Management*. Rather than focusing on changing a process as such one can focus on changing the way managers plan, organize, measure, and control their processes. This usually requires the introduction of a process-oriented management structure and systematic training for company managers.
- *Outsourcing*. Organizations are increasingly willing to subcontract the execution and management of processes to an organization that specializes in performing that kind of process.

Companies establish different criteria for determining process change priorities. Figure 7.6 suggests one general way of thinking about process change projects. Using this approach a BPM group can rank projects according to two criteria. On one axis of the matrix we consider the complexity and dynamics of the process, and on the other we consider the strategic importance of the process.

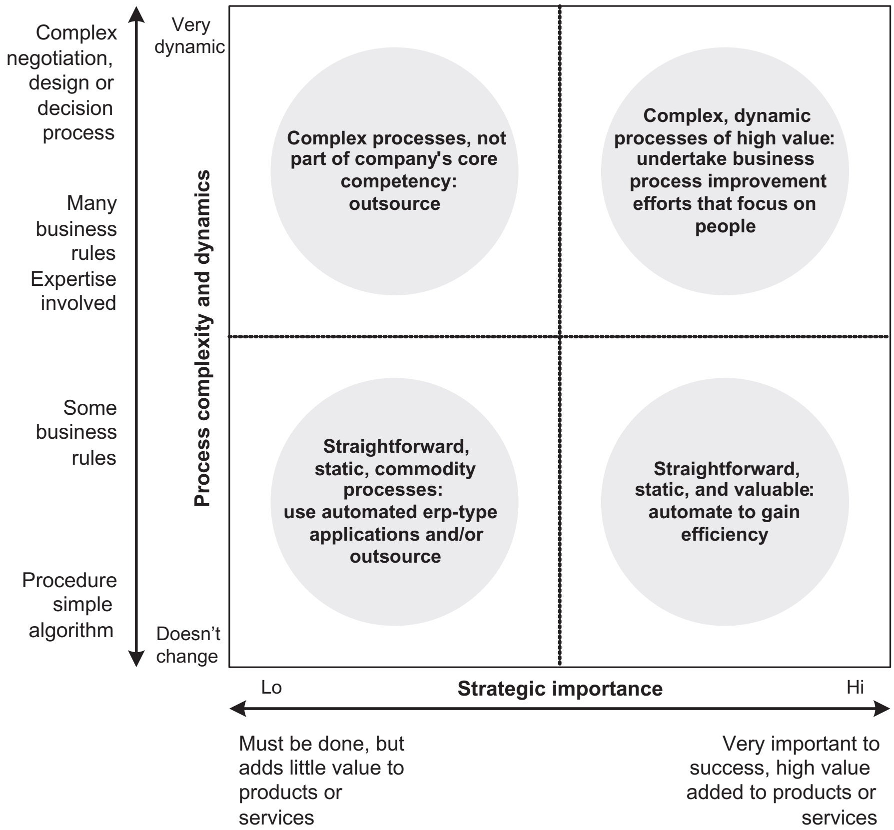


FIGURE 7.6

Analysis based on the complexity and the strategic importance of a process.

When we speak of process complexity and dynamics we ask what types of tasks are involved in the process. Are we talking about something like sorting the mail, which is a reasonably straightforward procedure, with perhaps a few rules for handling cases when employees have left or work at home? Or are we talking about an international delivery process that involves lots of rules for dealing with different country policies, tariffs, and address systems? Or, are we talking about a process that includes negotiating terms for international credit lines with Fortune 1000 companies? (To simplify things, when you think about complexity don't ask if it could be automated, but only ask what would be involved if a human were to do the job.) We also ask how often the rules change. Dynamics refers to the fact that some processes don't change very often, while others keep changing rapidly in response to changes in the market or regulations. Imagine, for example, being a member of an international bank loan team, whose process includes an activity that assigns risk premiums.

On the horizontal axis we simply ask how much value the process contributes to the products or services the company sells. Is the process a core competency of your company, or simply an enabling process that needs to be accomplished to ensure that you can do something else that really makes you money?

Now consider the kinds of processes we find in the four quadrants defined by our two axes. In the lower left we have processes that must be done, but add little value, and are basically straightforward procedures. These are tasks that we usually want to automate in the most efficient possible way.

Processes that fall in the lower-right quadrant are high-value processes that are straightforward. An assembly process may be straightforward and involve few decisions, but the process results in the product that the company sells and hence is very important. You want to automate these if possible to reduce costs and to gain efficiency. In any case you want to improve these processes, making them as efficient and consistent as possible.

Processes that lie in the upper-left quadrant are complex processes that have to be done, but don't add much direct value to your company's product or services. They just cause problems if they aren't done, and they are complex enough that they may be hard to automate. In most cases these are processes that you should probably consider outsourcing to another company that specializes in doing this type of process.

Finally there are the processes at the top right that are high value and complex. They often involve human expertise—processes like new product design or negotiating partnerships—and are hard to automate.

Obviously, one company's strategic process is another company's routine process. Company A may worry only about manufacturing the best widgets. For Company A shipping is simply a process that needs to occur to ensure that widgets get to customers in a timely manner. For Company B, a shipping company, their core competency is efficient, on-time deliveries. That's how they make their money. For Company B delivery operations are a strategic process.

In Figure 7.7 we show some of the solutions we have just proposed. If the BPM group is to prioritize and schedule the organization's process change resources, it has to either manage or at least coordinate the groups that provide the services described in Figure 7.7. Thus, for example, the BPM group might directly control the

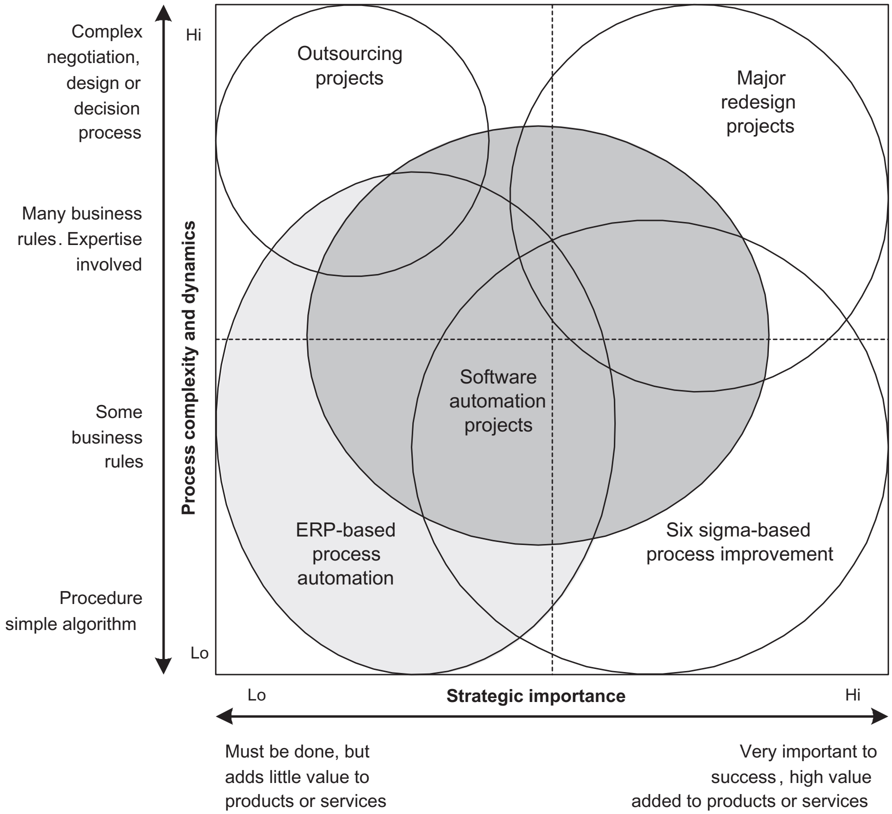


FIGURE 7.7

Generic solutions suggested by a classification of business processes.

company's process redesign teams. It might control or coordinate the company's Six Sigma efforts. It would probably not control strategy, but should work closely with them, especially when they or the company's executives are considering process outsourcing. Similarly, the BPM group should probably coordinate with IT in selecting processes for automation. It should also coordinate with any department or divisional managers who are considering installing ERP or CRM software applications. If the BPM group is properly empowered and situated, then it should be well positioned to bring order to the company's business process change efforts (Figures 7.8–7.11).

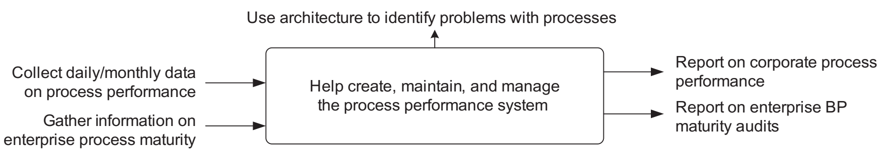


FIGURE 7.8

Create and maintain a process performance system process.

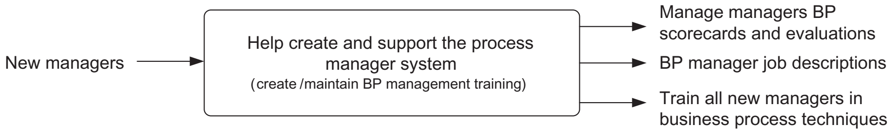


FIGURE 7.9

Create and support the process manager process.

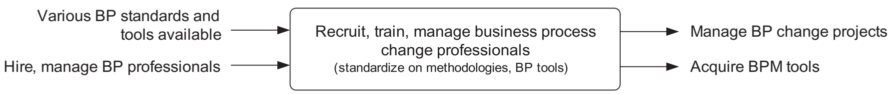


FIGURE 7.10

Provide BP professional training and support process.

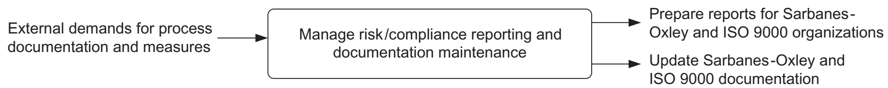


FIGURE 7.11

Manage risk and standards reporting process.

Help Create, Maintain, and Manage the Process Performance System

Some organizations maintain a business process architecture, but conceptualize it as something quite separate from their overall performance management system. This is especially true if they maintain an independent Balanced Scorecard group and if the organization focuses primarily on key performance indicators (KPIs) and performance measures that focus on divisional and departmental performance. As companies shift and begin to track value chain and process performance more carefully they tend to associate performance with processes, and it becomes natural to delegate the management of process performance reporting to the BPM group (see Figure 7.8).

As a general principle a BPM group with an efficient repository and with a process management system will track a wide variety of different measures. It will use some measures to evaluate the performance of business process managers and it will report other measures (KPIs) to senior management.

Often the BPM group will spearhead an effort to automate the reporting of process performance data to management, resulting in the creation of management dashboards that provide online information to executives. There is a lot of talk about executive dashboards today and there is a huge difference between what is on offer. Some of the dashboards overwhelm. Others report departmental data that are unrelated to process performance. The best of them, from a process perspective, are carefully organized around processes so that senior managers can quickly determine how each value chain is performing, using a few KPIs. Then, as desired, senior managers can click on process diagrams or models and drill down to determine the causes of any unexpected results. These process performance systems need to be carefully aligned with a well-defined business process architecture and represent one of the most interesting outcomes of the current corporate emphasis on business process work.

A growing number of companies use some kind of capability maturity audit to determine how well their organization is handling processes. The most popular of these is the Software Engineering Institute's (SEI's) Capability Maturity Model Integrated (CMMI) audit. CMMI postulates five levels of maturity and assigns an organization to one of those levels. An organization's assignment describes what the organization has already accomplished and suggests what tasks it should focus on next. As we saw in Chapter 5 SEI's approach is mostly built around managerial activities that are or are not present, and thus many organizations associate CMMI audits with process management training. Some organizations use less formal auditing systems. A few simply ask their managers to rate their own maturity based on a questionnaire that can be tabulated to suggest the level of the organization. However it's done, establishing a maturity level and then organizing to achieve the next level can be a powerful way of organizing a company's process efforts.

Help Create and Support the Process Manager System

In Chapter 5 we considered different ways organizations might structure process management. However it's done, companies are increasingly emphasizing the role that managers play in ensuring that business processes perform as they should. In Chapter 5 we considered several of the process frameworks that have defined management processes that company managers should master. Some, like CMMI, have defined an evolutionary path that companies can follow to evolve the skills of their managers. We have recommended that organizations create Balanced Scorecard systems that evaluate managers on their ability to manage processes in an effective manner. Whatever path companies take it is clear that most will want to provide their process managers with training (see Figure 7.9).

Process manager training can take many forms. In some cases companies will provide Six Sigma training for managers to provide them the skills they need to continuously improve their processes. Other companies are documenting processes with process flow models and provide training to ensure that each manager can read process diagrams. Still other organizations provide an entire curriculum in process management. In most cases, when process management training is provided, the BPM group organizes and coordinates the training.

Recruit, Train, and Manage Business Process Change Professionals

Many organizations expect their BPM group to function as a "Center of Excellence" and provide support for managers or other groups that are working on process redesign or improvement projects. Typically, the BPM group will have a few process change professionals who work directly for the BPM group and consult with or mentor other groups or project teams. At the same time it is common for the BPM group to offer training to other company employees engaged in process work.

The most organized version of this particular process is usually found in organizations that have embraced Six Sigma. In these companies there is a well-established training program that generates the individuals needed for process work. Typical titles include master black belts (individuals who are very skilled and consult with others), black belts (individuals who lead large process improvement projects), and green belts (individuals whose normal function is to work in a unit, but who temporarily join a process improvement team). In these organizations master black belts remain in the BPM group and are assigned to projects as needed. In some cases black belts are also supported by the BPM group. In nearly all cases this same group is responsible for training new black belts and green belts—although the actual training is often contracted to an outside firm (see Figure 7.10).

Similarly, it's common for organizations that are involved in large-scale process redesign projects to maintain a core of process redesign experts in a central group.

This process can easily overlap with the process management–training process, and that's quite useful, but there is a subtle difference between the two processes. One aims at training operational managers to manage processes on a day-to-day basis. The other aims at providing managers and others with the skills they need to take part in a business process redesign or improvement project.

Manage Risk/Compliance Reporting and Documentation

Every large organization today has to comply with several government regulations that are process oriented. The best example in the United States is Sarbanes-Oxley, a law passed to ensure, among other things, that executives can demonstrate that they understand where and how financial decisions are made in their organizations. The law requires that companies document their process decision points. In a similar way, most organizations that do business in Europe need to obtain International Standards Organization (ISO) 9000 certification. This ISO certification is meant to demonstrate that the companies understand their business processes and have quality control standards in place. Organizations respond to initiatives like Sarbanes-Oxley and ISO 9000 in very different ways. Some integrate these initiatives into their overall process architecture, while others simply hire an outside consulting company to generate the required documentation for the project (see Figure 7.11).

However companies create the initial documentation for Sarbanes-Oxley, ISO 9000, or any of the other risk and compliance requirements the documentation has to be maintained. Processes change and the documentation has to be kept up to date. This can either be a boring, tedious job, or it can be integrated with a business process architecture initiative, maintained in a repository, and become an active part of the effort that provides management with useful tools.

A Case Study: Boeing's GMS Division

So far we've considered a number of issues more or less independent of each other. Now we want to describe an organization that has integrated all of these ideas. The organization is the Boeing GMS division. In the course of the 1990s Boeing GMS changed itself from an organization in trouble to a world-class performer that has become one of the outstanding examples of the power of a comprehensive commitment to BPM through the organization of its day-to-day management system around business processes.

Boeing GMS is a group within Boeing's Air Force Systems business segment, which in turn is a part of Boeing's Integrated Defense Systems (IDS) organization. One of the primary products produced by Boeing GMS is the C-17 Globemaster III Cargo Plane—a huge airplane capable of carrying a payload in excess of 32 tons. The primary customer of Boeing GMS is the US Air Force. The program employs over 7000 people distributed between facilities located at Long Beach (California), Macon (Georgia), Seattle (Washington), and St. Louis (Missouri).

Senior Management's Commitment

Key to any serious process-based governance program is the support of senior management. Senior executives at most companies are willing to support a wide variety of process improvement programs, but are usually reluctant to provide the kind of ongoing, in-depth commitment a company needs to really change the way the organization does business. Senior management commitment happened at Boeing GMS because the company did most of its work for a single client: the US Air Force. In the early 1990s that client was very upset with the work the C-17 program was doing. The program was over budget and behind schedule, and the Air Force was threatening to stop purchasing aircraft. This threat focused senior management on the need to alter significantly the way the C-17 program was managing its business.

This management transition began with an executive leadership team that focused on how the C-17 program might be changed to improve its management practices and products. In essence, the C-17 program and later all of Boeing GMS committed themselves to implementing a management framework based on the Malcolm Baldrige National Quality Award criteria, which emphasize six areas, including leadership, strategic planning, customer focus, information management, HR focus, and the management and integration of processes, in addition to results. The Baldrige criteria are embedded in a quality management program that is managed by the US Department of Commerce and that recognizes outstanding US companies with an annual quality award (see Notes and References section).

As part of the deployment of Baldrige criteria (see Notes and References section) the C-17 program's focus on process management and integration spawned the *process-based management* (PBM) approach. The PBM approach starts by defining the organization as a series of processes and by assigning process management oversight responsibilities to senior executive process owners who in turn drive PBM downward by assigning process responsibilities to subordinate process owners. Thus a wide cross-section of the management structure within the C-17 program, and now within Boeing GMS, has process management responsibilities. In the mid-1990s senior executives not only supported the organization's transition to PBM but also assumed leading roles, serving as training role models and participating in joint reviews of processes with the government customer. Ongoing, active commitment of senior executives continues today as part of day-to-day process management.

Starting With a Vision and a Plan

Integral to the C-17 program's successful deployment of not only the PBM approach but also the overall implementation of the Malcolm Baldrige criteria was the implementation of a vision that focused on improving performance and quality as well as on customer satisfaction. As the PBM approach was developed and deployed the Air Force customer participated jointly in the identification and management of key processes.

The C-17 program's process focus began when there was considerable interest in process reengineering, but less emphasis on process management. Although there were some trials and errors along the way, the C-17 program eventually created the PBM methodology to guide its ongoing efforts. Boeing GMS defines PBM as follows:

> *Process-Based Management (PBM) is a management approach that defines an organization as a collection of processes focused on customer satisfaction and waste reduction by defining measures, and stabilizing and improving processes.*

Boeing GMS goes on to define the characteristics of a process-based organization as one that

- Views business as a collection of processes
- Uses strategic plans to drive processes
- Understands the precise relationship between processes and key business results and goals
- Focuses on key customer-driven processes
- Uses work teams to implement processes
- Uses process reports to determine the health of processes
- Manages by data

- Has the patience to work via processes
- Emphasizes sustainable improvements
- Demands improvement in processes across the entire business
- Integrates processes with other initiatives
- Uses common processes and standardization whenever possible

Modeling the Company and Its Processes

The Boeing C-17 program management team began its process work by defining the program's core processes and its major support or enabling processes and documenting them in an enterprise process model. Over time the processes were modified as necessary to adapt to the current Boeing GMS organization. Figure 7.12 provides an overview of the major processes identified in the GMS enterprise process model.

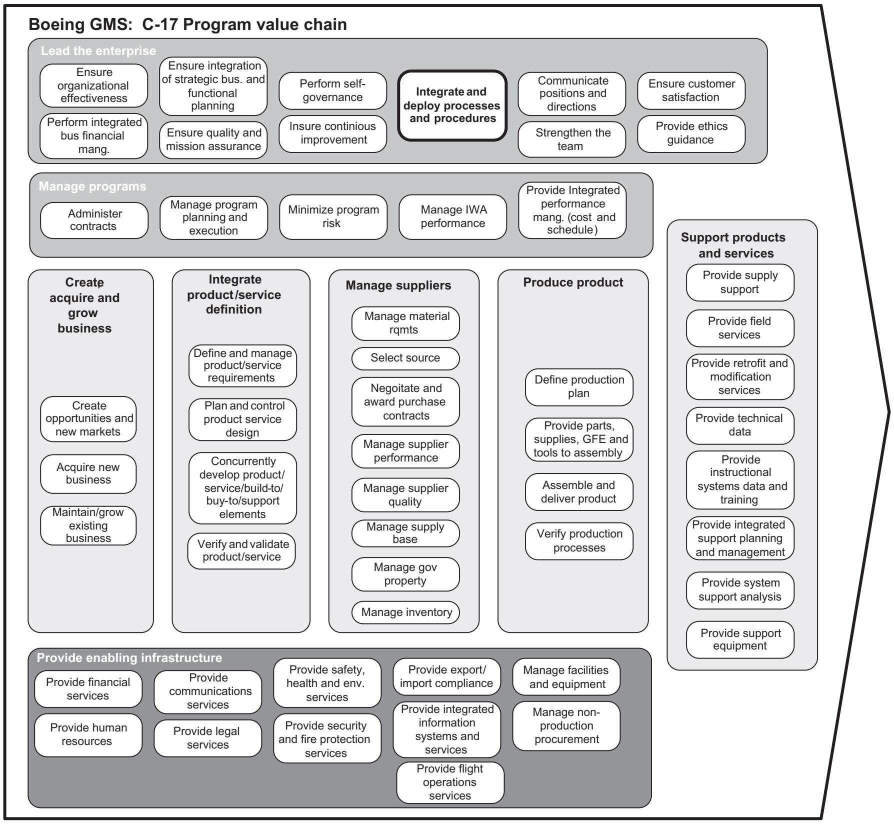


FIGURE 7.12

Boeing Global Mobility Systems program's core and support processes (Business Process Model).

The five tall, light-gray processes that run through the middle of the value chain are the five core processes. The two long processes above and the one below include management and support processes that help lead or enable the core processes. We've highlighted one process in the top box and made it larger. This is the process for process management itself—Boeing's BPM group—that helps define, deploy, and monitor all the other processes.

The process owners of the top-level core and support processes are called executive process owners. Collectively, they make up the Integration Board at the GMS level and the Process Council at the C-17 level, both of which are tasked with overseeing the deployment and health of the entire PBM effort, in conjunction with the process management integration group.

When PBM was first established the methodology was used by senior executives to define the core processes in the company. Then those executives deployed it in a top-down manner to define subprocesses and subsubprocesses (Figure 7.13). This effort continued until all the processes were defined.

A few complex processes—within production and engineering, for example—have been decomposed into as many as five levels of subprocesses. Ultimately, a total of slightly more than 300 processes have been identified. Each process has a manager. (Boeing calls them process owners.) One individual can be the manager of more than one process, and some individuals manage as many as six or seven processes. Thus, the GMS group currently has slightly fewer than 300 process managers.

Today, with the overall process structure in place, the BPM group uses the PBM methodology both to train new process owners in their responsibilities and to deal with changes that require the addition of processes or major revisions to existing processes.

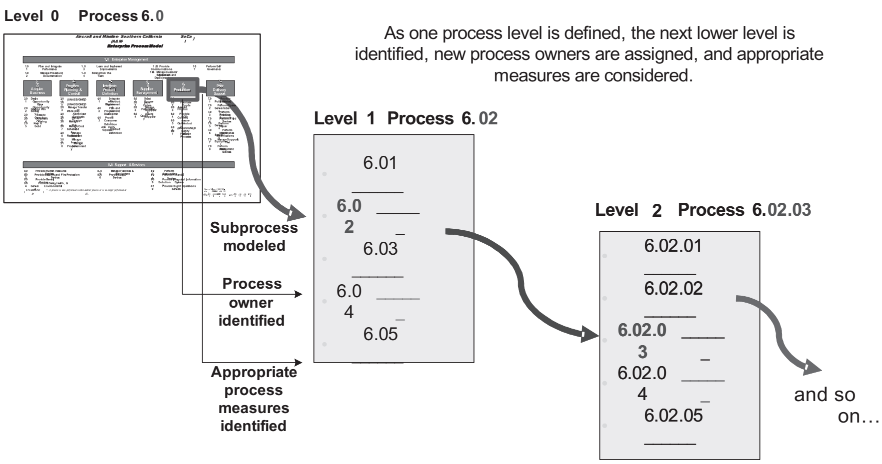


FIGURE 7.13

Iterative, top-down definition of processes.

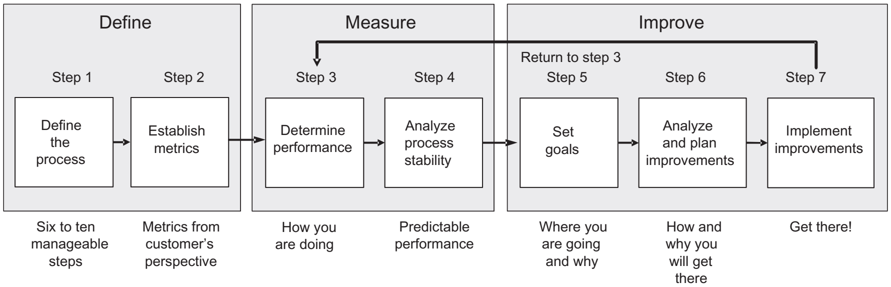


FIGURE 7.14

Boeing Global Mobility Systems' seven-step PBM methodology.

Figure 7.14 provides an overview of the seven steps in Boeing GMS's PBM methodology—which is very much a process improvement methodology. Key to the PBM approach is that every process in the enterprise process model is documented and has a responsible process manager. Those processes determined to be most critical to operational performance are additionally measured, managed, and reported on by the process manager. Moreover, process performance measures are aligned from the top to the bottom of the model using the approach described in Figure 5.10. Whenever a process fails to meet its goals the process manager develops a plan to improve the process. The improvements are implemented, and the cycle continues with further measurements and if necessary further improvements.

Processes are modeled using a popular swimlane flow diagram like the one shown in Figure 7.15. The top-down, iterative nature of process analysis at Boeing GMS does not require a given process owner to define his or her process in minute detail. Instead, it requires a general description of the process, like the one shown in Figure 7.15, in addition to a process definition form that provides more detail on supplying and receiving process linkages. Major activity boxes in one process owner's diagram may become the boundaries of subprocesses that are defined in turn by other process owners assigned to those subprocesses.

All processes are defined and documented by the responsible process owners and stored in a repository maintained by the BPM group that manages the "Integrate and Deploy Processes and Procedures" process. This group maintains a complete picture of all the processes within Boeing GMS.

Process Owners

A process owner may or may not be a regular manager. The owners of some lower level or technical processes are *subject matter experts*. The owner is familiar with the working of the process and is responsible for the planning, modeling, measurement, and improvement of the process if it is determined that the process should progress to the measurement step. The process owner most often works with a team of individuals to model, measure, and improve the process.

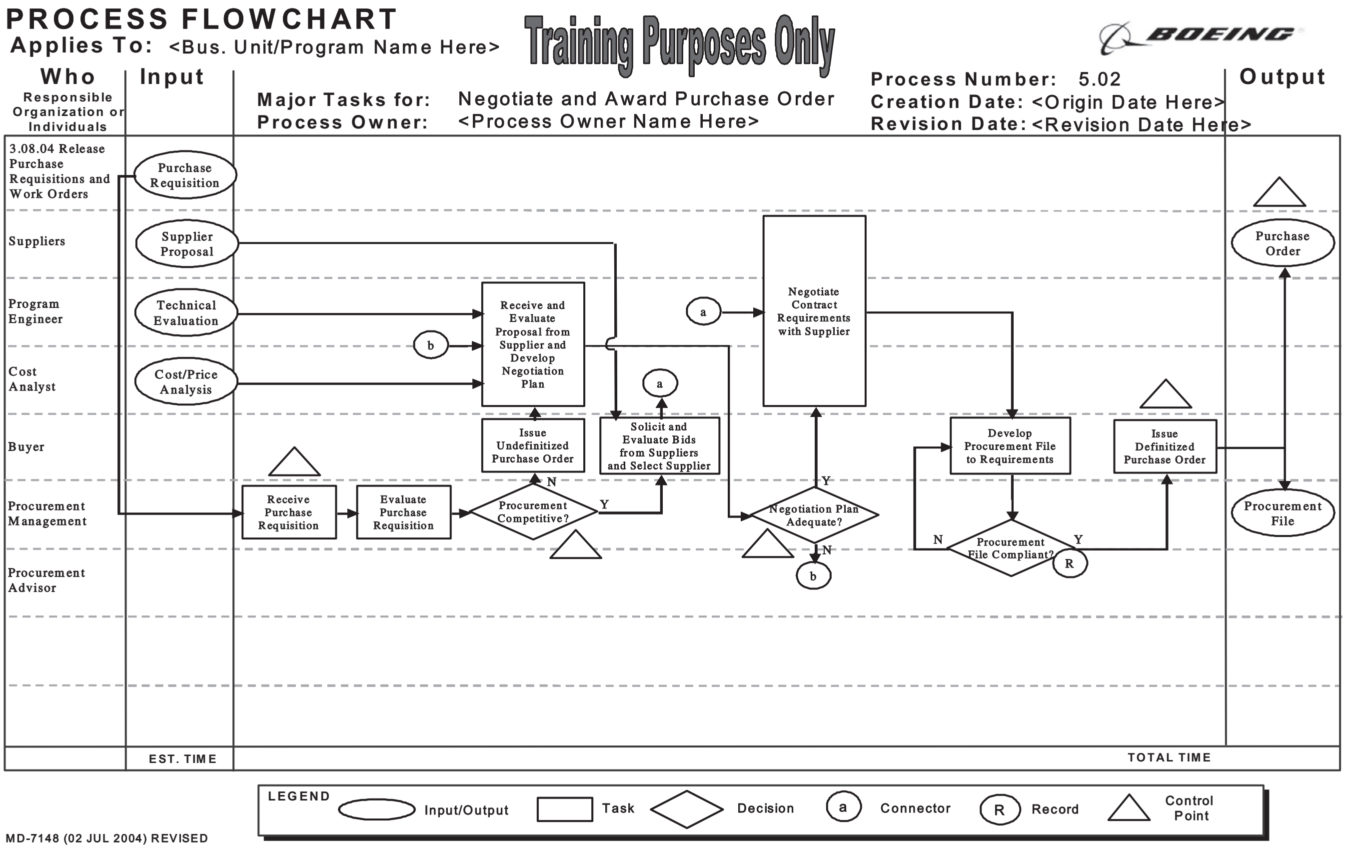


FIGURE 7.15

Boeing Global Mobility Systems Process Flow Chart.

When an individual becomes a process owner he or she is provided with 8 h of training in process management and a set of tools to help perform the job. If it is determined that the process will go beyond definition into measurement the owner is also responsible for negotiating an agreement with the customer of the process to ensure that the customer concurs with the output of the process. Customers may include external government customers in addition to internal customers (i.e., individuals within another process who are recipients of the outputs of the first process). In a similar way, the process owner as a customer of a process further up the chain must negotiate with one or more process suppliers to assure that his or her process will get the inputs it needs (see Figures 5.10 and 5.11).

The process owner is responsible for ensuring that the process adheres to all requirements and that the output meets the quality agreed to with the process's customer. When it is determined that a process must undergo measurement and improvement the process owner must also report on agreed-upon metrics each month. The report is made via computer, using the PBM system Boeing has developed, which is discussed later in this chapter. Process owners also attend process review meetings to ensure that the larger process of which their specific process is an element is functioning smoothly.

Executive process owners not only oversee their processes and monitor performance, but they also actively work to support the process owners who are responsible for the processes that make up their high-level processes. Each month, for example, executives are measured on how they provide recognition for at least 1% of their process owners, and on their attendance at process review meetings with their process owners.

Defining Process Measures

Once a process is defined and a process owner assigned, specific measures are determined for the process. Boeing wants to maintain the vertical and horizontal alignment of process measures, which means that many a subprocess defines its measures in ways that indicate how the outcomes of that process will contribute to the achievement of the desired outcomes of its superprocess.

Figure 7.16 provides an overview of the four general categories of KPIs, or metric categories that Boeing GMS uses. Quality and timeliness tend to be external measures usually determined by reference to the customer of the process. Efficiency and cycle time tend to be internal measures and are pursued to ensure that the process does what it does in the most cost-efficient possible manner.

Most process owners strive to track all four metric categories, but some track more or less depending on the nature and needs of the individual process. The key is to ensure that the KPIs take into account the goals of the customer and that there is a balanced set of measures to preclude too strong an emphasis in one performance area that would compromise performance in another.

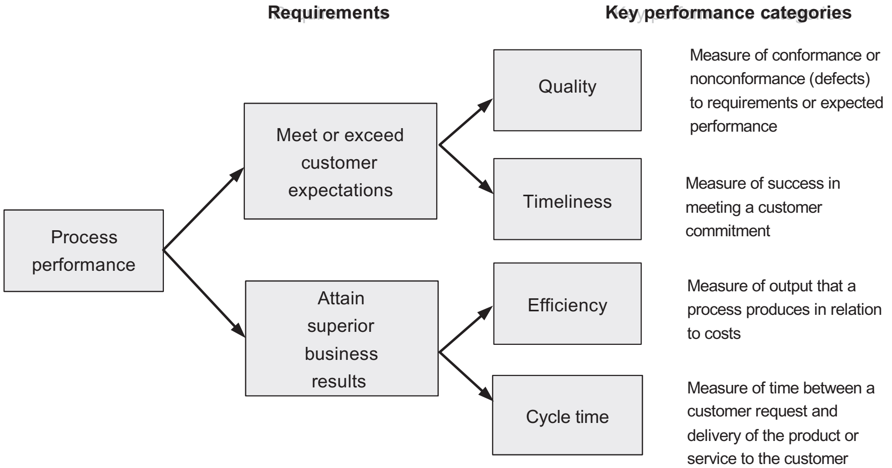


FIGURE 7.16

Basic types of process measures.

Boeing GMS Process-Based Management System

Boeing GMS's IT group (a functional unit, not a process) created and maintains the process-based management system (PBMS). PBMS is a set of software tools and a repository that helps process owners document processes and measures, that gathers and summarizes process performance data, and that stores all process information. Boeing had experimented with a variety of modeling and reporting tools, but eventually decided to build its own system to ensure that everything was integrated to support PBM.

PBMS is available to every process owner. Initial process descriptions and process models are documented using PBMS tools. Process measures are specified and monthly reports are prepared via PBMS to allow an analysis of the performance of each process that is being measured.

Figure 7.17 illustrates metric reports delivered by Boeing GMS's PBMS program. The bars represent monthly performance on process measures. The lower line that crosses both bar charts is what the process owner and the customer have agreed is acceptable performance. The dotted line is the process goal (i.e., the level of performance that both owner and customer agree would be ideal). Any time a bar falls below the lower line it indicates that the output of the process is below the minimum acceptable level.

The overall performance of all of the metric panels is summarized in the matrix bar above the two charts. In this case red, yellow, green, and blue are used to suggest a process is performing below par, is in need of improvement, or is meeting or exceeding the goal.

Whenever a process owner has a process that is performing below par he or she is required to coordinate and submit a plan to improve the process. The performance of processes and the review of process improvement plans are monitored by the

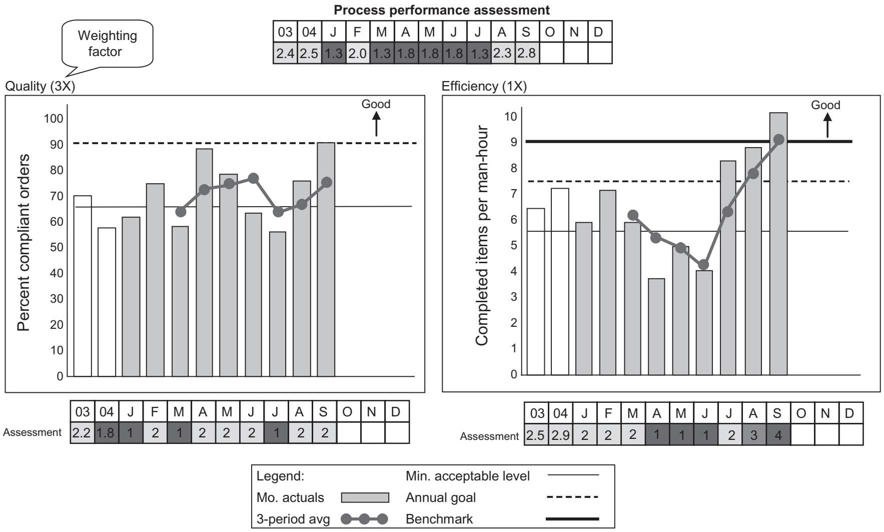


FIGURE 7.17

Computer-based performance reporting system for process owners.

process management integration group, which offers technical support when needed. For example, if a process improvement plan requires extensive changes to achieve quality goals this "process management" process team may facilitate assignment of a Six Sigma black belt to assist the process owner.

During the initial deployment of PBM considerable time was spent defining and modeling processes and determining appropriate measures. This effort continues on an annual basis, when each process owner validates with his or her customer that the process and its measures are still accurate and effective. When a new process is developed it often requires months of data analysis to identify just the right measures to track on a monthly basis.

As in any organization, there is turnover among managers and other personnel and new process owners always need to be trained. In a similar way, existing process owners receive refresher training on a regular basis as enhancements to PBM and PBMS are continually made.

PBM, Process Redesign, Six Sigma, Lean, and Balanced Scorecard

Most companies embrace a variety of process improvement programs. In some cases the IT department has a process redesign group that looks for automation opportunities. The same company may also have Six Sigma practitioners spread throughout the company and a Balanced Scorecard group working to define management objectives. Unfortunately, in most cases these groups operate in isolation, often duplicating efforts and in the worst case contradicting each other.

Boeing's GMS program has individuals trained in each of these disciplines. Unlike most companies, however, these groups are not working independently to define tasks for themselves. Instead, they come together in support of PBM. As specific process owners encounter problems achieving their process objectives they coordinate with the PBM process team to determine how to improve their performance. In most cases the individual process owner proposes a solution that a team from the specific process can execute. When they need help the PBM process team provides it, drawing on specifically trained process change practitioners as needed.

ISO 9000, CMMI, and Sarbanes-Oxley

During the past 2 years publicly held US companies have been struggling to define where and how financial decisions occur within their organizations. They have done this to comply with the requirements of the US government's Sarbanes-Oxley Act, which Congress passed in the aftermath of several accounting scandals. Implementation of the requirements was complicated and, while it was difficult at best to define the requirements, Boeing GMS already had related processes defined. The applicable process owner and process team studied the Sarbanes-Oxley documentation and then worked through the process diagrams, identifying every activity and decision required by the legislation. Once the initial documentation was finished the group checked with other specific process owners to ensure that their understanding matched the understanding of all the owners involved, and then generated the required documentation. Boeing GMS has built the Sarbanes-Oxley information into its basic process models, and can therefore update it whenever the Sarbanes-Oxley requirements change as a by-product of routinely updating process changes.

Dealing with Sarbanes-Oxley went relatively smoothly for Boeing GMS, in part because it has undertaken several similar exercises. Several years ago the Boeing process team used its process modeling and measurement system to rapidly generate ISO 9001 documentation. It was accomplished by creating a map to show where each item in ISO is related to the Boeing PBM structure. Process owners were then assigned to ensure that their process documentation and related procedural documentation were in compliance with ISO requirements.

Later the Boeing GMS process owners did something similar to prove to an audit team that the C-17 program within Boeing GMS was operating at CMMI Level 5.

Most companies face significant challenges when asked to document their ISO, CMMI, or Sarbanes-Oxley compliance, because they don't have the detailed data required by these various systems, or at least they can't organize them in any cohesive format. Boeing GMS, on the other hand, has detailed and precise division-wide data that map to all the requirements that the various standards expect, and it has its data organized according to a comprehensive process hierarchy. Thus, Boeing GMS will be prepared to conform to any future standard that requires that an organization document how its processes are organized and how they are performing.

The Success of the Transition to Process-Based Management

Figure 7.18 provides a summary of the problems Boeing GMS faced and the impressive turnaround it has achieved as a result of its implementation of the Baldrige framework, in general, and process management, in particular, since its launch in 1994. Pre 1994 Boeing GMS was failing to meet its agreements with the Air Force. This forced the shift that began in 1994. It took about 4 years for the GMS group to completely turn itself around, but in the end the division was one of the best-performing manufacturing organizations in the world. Boeing GMS won the Malcolm Baldrige National Quality Award in 1998 and the California state version of the Baldrige Award, the California Award for Performance Excellence Gold, and the California Governor's Award in 2002. A glance at the figures show that Boeing GMS has continued to improve ever since. (Some of the numbers seem to drop a bit in 2000, but that reflects a major increase in the units being processed and not a drop in overall quality.)

Following the success of Boeing GMS other businesses within Boeing have adopted the Baldrige criteria and launched their own PBM programs. Boeing's Logistics Support Systems (formerly Aerospace Support) adopted the PBM methodology as well as the Malcolm Baldrige criteria and was recipient of the 2003 Malcolm Baldrige National Quality Award. In March of 2004 Boeing's IDS organization formally adopted the Malcolm Baldrige Criteria for Performance Excellence as the framework for its business model company-wide. Boeing is also embarking on a company-wide process management methodology for all its businesses, which will enable all its programs to operate and report within a common process framework. Meanwhile, IDS is now deploying an automated process management system that will eventually incorporate Boeing GMS process data currently residing in the PBMS.

Performance factor

			Collier	CalQED	Daedalian	Baldrige			IW finalist	Awards
				5 X	7.5 X	17 X	18 X	31 X	50X+	RONA
			120 Aircraft decision	Largest multiyear contract	Flex sustainment	C32/C40	15 C-17 add-on +60 appropriation	UK order	UK 1-4 deliveries	Milestones
		+10 Days	+25 Days	+40 Days	+20 Days	+60 Days	+100 Days	+204 Days	+107 Days*	Schedule
		442 Days	380 Days	374 Days	349 Days	286 Days	268 Days	223 Days	208 Days	Span time
	5.0M	4.0M	2.5M	1.8M	1.4M	866K	707K	644K	535K	Rework/ repair $
	4.2%	4.3%	2.9%	2.5%	2.2%	1.9%	1.4%	1.4%	1.1%	COQ
	100	80	50	17	12	8	6	10	15	Delivery waivers
58%	58%	67%	100%	92%	100%	100%	100%	100%	100%	Systems
1.7	1.6	2.3	2.9	3.3	3.4	4.1	4.2	4.1	4.2	CPAR
'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	Key

Days*ahead of schedule to USAF decreased due to an insertion of four UK planes into the 2001 schedule

FIGURE 7.18

Boeing Global Mobility Systems achievements from 1996 to 2005.

Summary

Lots of people today are talking about BPM. For most the phrase refers to isolated efforts, or at most an organization-wide commitment to Six Sigma, performance measurement, or a Balanced Scorecard. Few companies have had the vision and the commitment to organize their entire management effort around processes and to create the infrastructure necessary to integrate and consistently manage all their business process efforts on a day-to-day basis. Boeing's GMS group is one of the rare exceptions that has not only embraced the vision, but also followed through and demonstrated the power of the approach.

When one examines the various components of Boeing GMS one finds elements that are used by hundreds of companies. The difference, however, is that Boeing GMS has pulled them all together into a complete system, and they have placed their business managers operating as process owners at the center of the system. Boeing's GMS BPM program isn't something that a BPM group runs. It's simply the way that Boeing's managers run their day-to-day business, as they have for the past 10 years.

Today, Boeing GMS is one of the best organized and managed business organizations in the world, and its performance and quality continue to be maintained on a day-to-day basis by its process owners.

The BPM Group

BPM groups undertake different tasks depending on the organization of the company. In some cases they are established to help a management team create a business process architecture. In other cases they are created after the initial architecture is complete and are charged with maintaining it. In some cases the group is started from scratch. In other cases the group was originally a Balanced Scorecard group or a Six Sigma group. In other cases these functions are incorporated. Increasingly, the BPM group is being asked to coordinate all process work, and that means that the group needs to either directly control or at least coordinate the resources of all the company's process groups or initiatives. The alternative is competition among process initiatives, a lack of coordination, and inefficiencies. If the BPM group is established and given a proper role it can help create and maintain the company's enterprise-level process management tools, report on process performance to managers, and prioritize and coordinate a company's process efforts. In this case it will represent a major step toward creating a true process-centric organization that is able to use process to manage and change to meet challenges and to seize opportunities.

Notes and References

Most of the material on aligning processes from the top down derives from the work at Boeing GMS (formerly called Boeing A&T). The best article describing this effort is Pamela Garretson's "How Boeing A&T Manages Business Processes," which is available at http://www.bptrends.com (search for Pam Garretson).

The Baldrige Award is a US government program managed by the US Commerce Department. Information on the Baldrige program is available at http://www.quality.nist.gov. Baldrige Awards are given annually to acknowledge superior companies. They are based on a series of evaluations that consider candidate performance in seven performance categories. The questions about process management are derived from Category 6.

Baldrige Criteria questions for Category 6, Process Management, include the following concepts:

- *Establishment*: What are your key value creations and key support processes and how does your organization determine them?
- *Requirements*: How do you determine requirements for your key value creation processes, incorporating input from customers, suppliers, and partners?
- *Measures*: What are your key indicators or performance measures to control and improve these processes?
- *Prevention*: How do you prevent rework and defects in these processes?
- *Improvement*: How do you improve these processes?
- *Learning*: How do you share lessons learned?

The Integrate and Deploy Processes and Procedures process is one of Boeing GMS's processes managed by their BPM group. In effect, this is the process that helps Boeing GMS maintain its process health and deployment. Individuals involved in activities that fall within this process perform tasks that one would associate with a PBM support group in another organization, and the process owner of this group functions as the Boeing GMS Chief Process Officer. This process is responsible for overseeing the deployment of PBM, training new process managers, monitoring the performance of other processes, assisting process owners who need help, reporting on the process health of the enterprise, and providing other services to the organization. This "process for process management" falls organizationally within the GMS Business Excellence function that is additionally responsible for such activities as GMS Strategic Planning, the GMS Vision Support Plan (a version of a Balanced Scorecard), and the GMS Malcolm Baldrige assessment process.

In the fall of 2006 BPTrends did a survey of companies who had undertaken business process change projects. One of the interesting correlations we found was between companies that had BPM groups (or Centers of Excellence) and companies that had success on their BPM projects. Companies with BPM groups reported being much more successful. More information on this survey is available at http://www.bptrends.com (click on Surveys, and then check the survey authored by Nathaniel Palmer that was published in early 2007).

Tregear, Roger. *Establishing the Office of Business Process Management*. Leonardo Consulting, 2010. An excellent, practical introduction to the problems of establishing and managing a BPM Center of Excellence.

PART II

Process-level concerns

In Part II we will consider what's involved in analyzing processes and in undertaking process redesign and improvement projects. Figure P2.1 reproduces the overview of process work that we discussed in the introduction to Part I of the book. In this part we will focus on Level 2 concerns, which involve specific projects to redesign processes and the day-to-day work required to handle ongoing execution of business processes.

We will begin in Chapter 8 by discussing the nature of business process problems and discussing how a process redesign or improvement team can begin to understand and scope a new process problem.

In Chapter 9 we will consider basic business process flow diagrams. We will introduce a general approach to flow diagramming that is based on a combination of Rummler-Brache, Unified Modeling Language activity diagrams, and Business Process Model and Notation, and consider how flow diagrams can be used by process analysts. We will also mention a newer notation for dealing with dynamic processes.

In Chapter 10 we will drill down and consider techniques that can be used for task analysis, and consider what's involved in defining the knowledge that workers

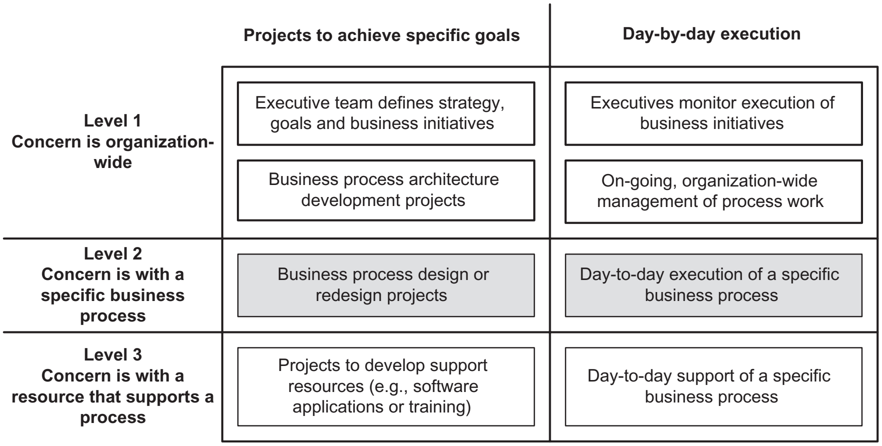


FIGURE P2.1

Types of process activity in organizations.

require to perform tasks. We will also discuss the role of business rules in process analysis.

In Chapter 11 we will describe the role that managers play in the day-to-day success of business processes and consider what's involved in analyzing and improving the managerial activities associated with problem processes. We'll also consider the use of business rules in a little more detail.

In Chapter 12 we will describe the incremental approach that Lean and Six Sigma practitioners apply to the improvement of business processes.

In Chapter 13 we will step through the activities defined by the BPTrends process redesign methodology that synthesizes many different techniques, while also emphasizing the importance of process management, information gathering, communication, and change management for any successful project.

CHAPTER

Understanding and scoping process problems

8

In a few leading companies a corporate business process management group will use a business process architecture and associated performance measures to define and scope new process redesign or improvement projects. Most organizations are less mature. In those organizations it is usually a senior manager who decides there is a problem and creates a team to determine what can be done. In this situation the team begins by gathering information in an effort to understand the nature of the problem that concerns the manager who initiated the effort. In such an informal situation one cannot assume that the manager who initiated the project really understands the problem. The manager knows something is wrong, but he or she may not know exactly what activities are causing the problem or have a clear idea about the nature of the changes that will be necessary to resolve the problem. In essence, the first task of any process team is to be sure that it has a good definition of the nature and scope of the problem. Once the team understands the problem it needs to consider in a very general way what kinds of changes might make a difference. In some cases the team should be prepared to tell the manager that the problem cannot be solved within the time or the budget that the manager has suggested. In other words, the first phase of any process change project is to define the project itself, consider possible solutions, and then make a recommendation about what level of effort and budget will be needed to solve the problem.

In this chapter we want to consider the nature of business process problems and suggest some smart approaches to scoping a process redesign or improvement project. We begin with a general discussion of the nature of processes to establish a common vocabulary and then we proceed to consider the nature of the process problems that teams are likely to encounter. We end with a discussion of techniques for scoping problems.

What Is a Process?

As we mentioned in an earlier chapter the idea of a process is becoming more flexible as organizations try to tackle newer business situations, especially situations in which what is done varies according to the client and circumstances. The classic concept of a process describes it as a bounded set of activities that are undertaken in response to some initiating event to generate a valued result. Processes can be

Business Process Change. https://doi.org/10.1016/B978-0-12-815847-0.00008-X

very simple or extremely complex. One example of a process might involve the use of a software application that is initiated by a salesperson swiping a credit card across a reader. The software application called by the reader would proceed to transmit information to a credit card center mainframe to determine if the card is valid and the amount is acceptable. Upon receipt of an approval, the application might cause the reader to print out a purchase slip for the customer to sign (see Figure 8.1).

When process work was first done in manufacturing and was very much influenced by systems theory it was popular to say that a process took inputs and transformed them into outputs. I still find this acceptable, but many today prefer to avoid this language, feeling that it sounds too much like a manufacturing operation where physical objects were literally reshaped into a physical product. Most of today's service processes are more likely to take information and modify it to generate new data, recommendations, or a printed document. Some prefer to say that the process creates value.

Consider another process that might be initiated by a call from a taxpayer for help in determining what tax form to use. In this case the call would be answered by a person who would ask questions and then tell the taxpayer what form to use. We can imagine a general description of the *answer taxpayer inquiry* process, and hundreds of instances of it as particular tax clerks answer phones and undertake the process with different taxpayers. Still another process might be a corporate supply chain that responds to customer orders by generating and delivering products to customers. The supply chain process at any large company is complex and could easily be subdivided into subprocesses that contain hundreds of activities and thousands of business rules and are implemented by employees located throughout the world.

We understand that our initial definition is a little vague, but we prefer to use the word "process" informally, as the term is normally used, and then refine our understanding with some adjectives.

One important distinction to consider when thinking about a process is whether it functions as a core or operational process, a management process, or an enabling or support process. We discussed this in Chapter 4 when we considered process architectures, and you should review Figure 4.6 if you are unclear about the distinction.

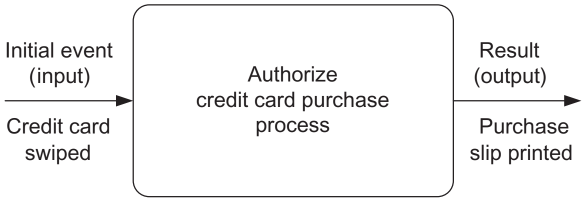


FIGURE 8.1

Example of a simple process.

Process Levels and Levels of Analysis

Another key concept is the idea of a process hierarchy and the use of levels to describe the subdivision of processes. We show an abstract process hierarchy in Figure 8.2 and have added notes on the left to suggest how a process analysis effort will tend to vary, depending on whether we are dealing with very large processes, mid-level processes, or specific activities or tasks.

As a generalization, we can usually divide the process hierarchy into three parts and associate problems and analysis techniques with specific levels. Broadly, one set of process analysis techniques is used to redesign or improve higher level processes. Another set is used on the types of process problems we find in the middle of the process hierarchy. Still another set of techniques is appropriate for processes at the bottom of the hierarchy. Figure 8.3 provides an overview of this three-part distinction.

Thus the top part of the process hierarchy is usually associated with architecture problems and with problems of coordination between departments or functional

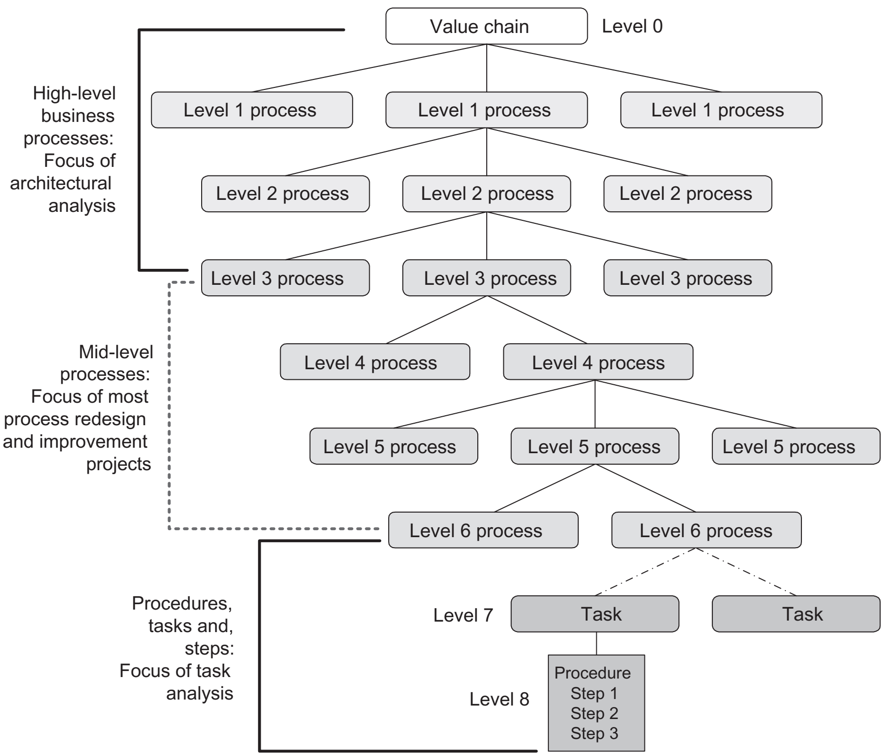


FIGURE 8.2

Hierarchical decomposition of a value chain suggesting how "level of analysis" corresponds to process level.

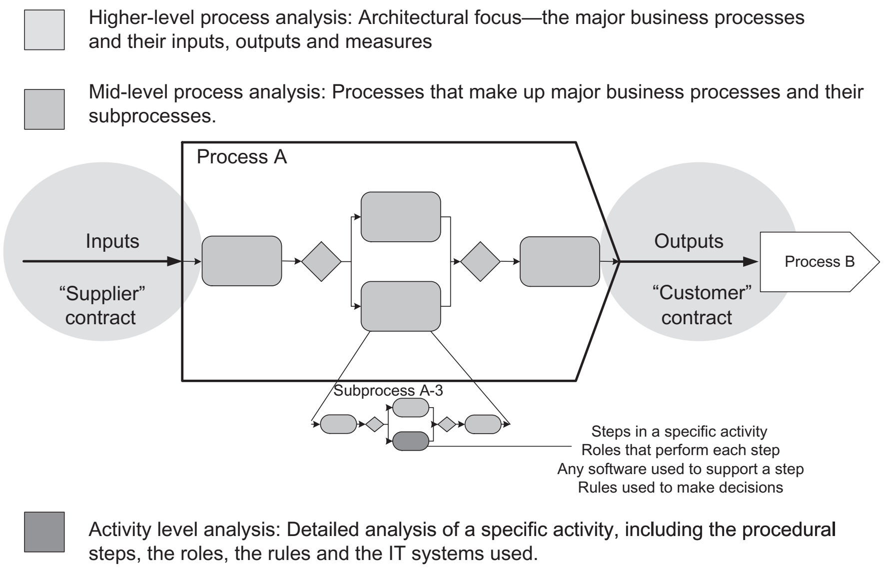


FIGURE 8.3

Overview of the different levels of process analysis.

units. In this case we focus on aligning inputs and outputs and write contracts to specify what Process A will need to deliver to its "customer" Process B.

Midsize problems usually occur in processes managed within a single department or at most a few departments. The problems often require that the processes be simplified or the sequences rearranged. Nonvalue-adding processes or subprocesses need to be removed; some activities need to be automated.

Low-level problems usually involve individual performers or software systems. They usually require a detailed task analysis. In some cases the business rules used by the performers or the systems need to be specified. Often training programs and job descriptions need to be developed.

Simple and Complex Processes

Another way to begin the analysis of a process is to consider the overall complexity of the process you are going to analyze. Simple processes usually follow a consistent, well-defined sequence of steps with clearly defined rules. Each step or task can be precisely defined and the sequence lacks branches or exceptions.

More complex processes involve branches and exceptions, usually draw on many rules, and tend to be slightly less well defined. They require more initiative on the part of human performers. Really complex processes demand still more initiative and creativity on the part of human performers. They are usually processes that cannot be automated using current technologies. We usually do not train people to do these tasks, but hire people who have advanced degrees and have already demonstrated the creative or analytic skills required. These processes are less well defined, change often, and evolve as time passes. Successful performance usually requires that the performer study an evolving body of knowledge to be prepared to perform the tasks required to create successful results. Figure 8.4 illustrates the continuum that ranges from simple, procedural processes through more complex processes to very complex processes.

It is popular today to suggest that the nature of work has changed in advanced economies. In the past workers were more likely to be engaged in the type of procedural tasks one still finds in production line manufacturing and in some clerical tasks. Increasingly, however, today's workers are engaged in tasks that require more knowledge, and many writers refer to them as *knowledge workers*. For some this implies that the workers use computers to acquire or manipulate the information they need to do their jobs, but for others it simply refers to the fact that the workers perform in more complex processes.

Figure 8.5 pictures the space that results when we cross levels of analysis with process complexity. On the horizontal axis we place the task complexity continuum. To the left we have simple, repetitive tasks. In the middle we have tasks that require more skill and flexibility. On the extreme right we have tasks that are very complex and require considerable creativity. On the vertical axis we have placed a continuum that ranges from high-level, very abstract processes at the top to low-level, very concrete activities and tasks at the bottom.

As long as we are trying to provide only a very high–level overview of the processes involved we are not concerned with the specific nature of the task. At the architectural level it is possible to describe both procedural and complex processes with equal ease since we are not concerned with details, but only with abstractions. Thus, for example, a supply chain is a very large process that contains some procedural subprocesses and some very complex planning subprocesses. At the level of abstraction that we work at when creating a business process architecture and defining

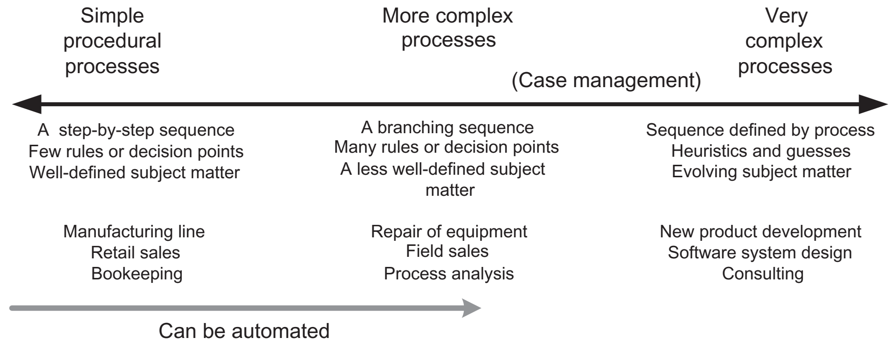


FIGURE 8.4

Continuum suggesting how processes vary as to their complexity.

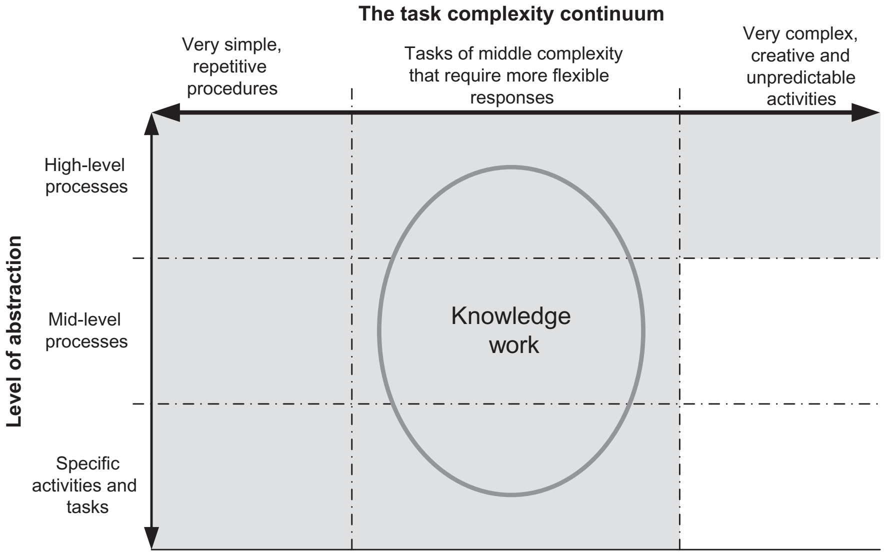


FIGURE 8.5

Matrix of possibilities created by crossing levels of analysis with process complexity.

major process performance measures we simply do not care about the numerous and various specific tasks that make up the high-level processes. The real supply chain may involve numerous loops and feedback cycles, but at the high level we are simply concerned with defining major processes that will need to be managed and measured and defining handoff points that will need to be coordinated. For this, conventional modeling with a workflow notation, such as Supply Chain Operations Reference or Business Process Modeling Notation, will serve very well.

Extending our analysis we can analyze and describe mid- and low-level procedural processes without too much difficulty. It becomes more difficult as we try to analyze mid- and low-level processes of moderate complexity, and it becomes very difficult to analyze mid- or low-level processes of great complexity. Consider one example—the various activities of the CEO of a large corporation. It might be possible to specify that all CEOs are concerned with several general processes, such as defining company strategy, finding a successor, and maintaining relationships with senior government officials. Beyond such generalizations, however, it would not be valuable to try to analyze exactly how the CEO went about defining strategy, let alone how he or she managed very specific tasks, such as conducting interviews or handling luncheon meetings. Companies do not try to specify exactly how their CEOs, their creative marketing directors, or their lead software architects should do their jobs.

It is increasingly popular to refer to very dynamic, complex processes as *case management processes*. This term is derived from medical practice, and the term *case* in this instance refers to a patient. When we look into notation in more detail in later chapters we will consider some proposals for how we might model very dynamic processes.

Most process analysts today, however, are not focused on case management processes, but they are definitely focused on defining and improving processes that involve knowledge workers. Analyzing the activities of these individuals is complex enough and the analysis techniques we will focus on in the remainder of this chapter are mostly used to define mid-level processes of moderate complexity. That is where the interesting challenges in analysis and design lie today.

Business Process Problems

Projects often begin with problems. The challenge is to figure out the nature of the problem, and then to consider what kind of intervention might be required to resolve it. We can formalize this a bit with a model of problem solving—which we refer to as the Gap Model—which we illustrate in Figure 8.6. Formally, a *problem* is the difference between what exists now and what we desire. We represent that with two boxes. The left box is labeled the existing or As-Is process. The right box is labeled the redesigned or To-Be process.

We can talk about the As-Is and the To-Be processes in either of two ways. We can speak of measures that describe the performance of the process, or we can describe how the As-Is or the To-Be process works. The manager who assigns the project, for example, might simply say that the output of the process needs to be doubled, or he or she might say that defective outputs need to be cut in half. Similarly, the manager might say that competitors have automated similar processes and we need to automate our own process. Depending on the situation the project team usually ends up working back and forth between descriptions of what is and what might

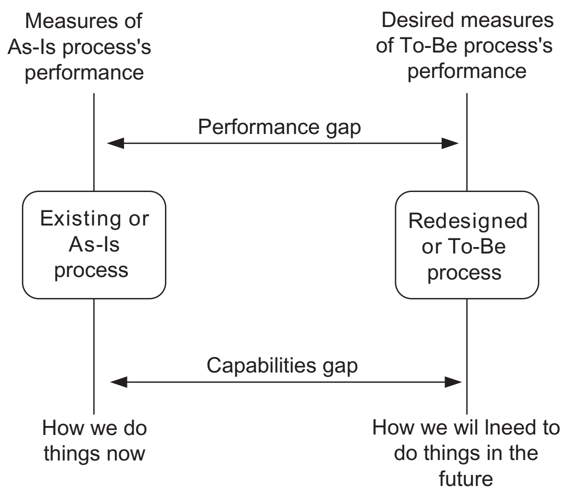


FIGURE 8.6

Gap Model.

be and between measures that define how the process works today and proposed measures that will describe how the process ought to perform once it is "improved."

We refer to the difference between measures of the performance of the As-Is process and the To-Be process as the performance gap. We refer to descriptions of the difference between how things are done now and how they could or should be performed in the redesigned process as the capabilities gap.

One problem that any project team will encounter is the difference between descriptions of actual problems and descriptions of causes or consequences. Figure 8.7 suggests some of the different types of statements you might encounter. The project team is forced to ask, often several times, "Why do you think this happens?" or "Why is this a problem?" until the team is satisfied that they can clearly define the actual problem. Often measures or statistics cited by management will be measures of consequences and the team will need to work backwards to determine what problem they will need to eliminate to improve the measure or outcome that management is concerned with changing.

If we extend the Gap Model we can see that it also provides a framework for thinking about the kinds of analytic techniques we might want to use to define the problem and can even suggest the redesign techniques we might use to resolve the problem. Figure 8.8 illustrates the relationship between the problem gap and analytic and redesign techniques and illustrates the use of the model with an actual project.

In the example illustrated in Figure 8.8 the manager assigning the project stated that the goal of the project was to produce outputs in half the time currently required. Thus, presumably, the project team gathered data on the time required by the current process and then projected how much time they would have to eliminate to achieve the project goal. Since the essence of the problem involved the time the project takes the team used a time study technique, which involved determining the time each step takes and the time that elapses between each step. They relied on Lean techniques to examine each step to determine what could be eliminated or streamlined. In other words, the nature of the capability gap often suggests the project approach, analysis data to gather, and the process redesign or improvement techniques that will be most useful.

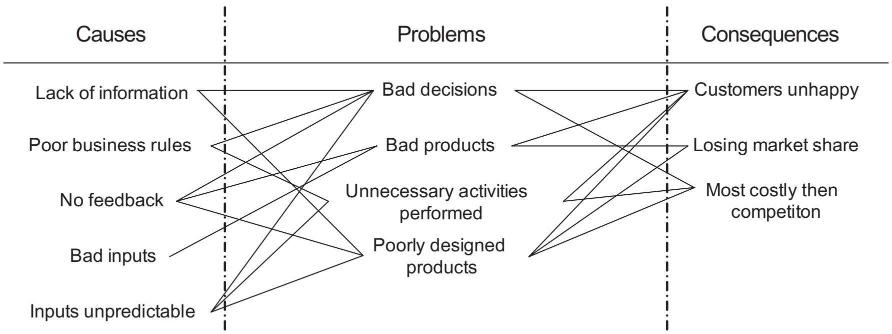


FIGURE 8.7

Some relationships between causes, problems, and consequences.

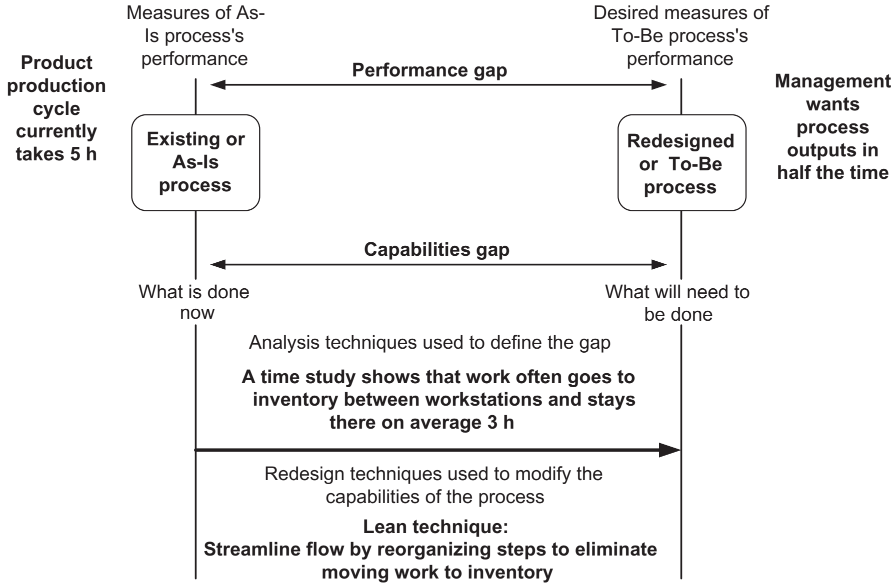


FIGURE 8.8

Gap Model suggests the need for analysis and redesign techniques.

The Initial Cut: What Is the Process?

At some point during the scoping process you will need to work up a good overview of the existing or As-Is process. Most teams begin by asking management about the nature of the process. What is it called, for example? Let's assume for the purposes of our discussion that the management of a pizza company, with several different stores, asks you to help improve their pizza delivery process. From the very beginning you assume that the process being discussed is the *pizza delivery* process. It is usually best to define a process with a verb-noun phrase, so we mentally turn "*pizza delivery*" process into "*deliver pizzas*" (see Figure 8.9).

At some point we usually acquire more information. At a minimum we define the inputs that trigger the process and the outputs that signal that the process has successfully concluded. At the same time we usually define the major substeps in the overall process—just as a first cut at saying what is included in the process and what is excluded. Thus in the case of our pizza delivery problem we determine that the process begins when customers call to order pizzas. Their calls are managed by a phone system that takes calls for the entire city and then routes them to the appropriate store. The actual process within a given store begins when they are notified of an order. They proceed to cook the pizza. Meanwhile the delivery manager schedules the delivery, grouping orders so that each delivery run will be as efficient as possible. If business is brisk the area around each store is divided into regions and deliveries are organized according to region so that the delivery trucks travel

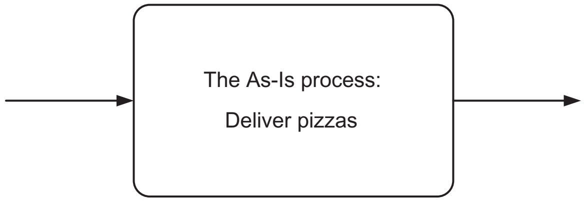


FIGURE 8.9

Very general overview of the process we are asked to study.

the minimum distance and the pizzas are delivered warm. When a delivery vehicle becomes available and a set of orders is assembled delivery takes place. Comments made by managers about the availability of delivery trucks lead us to add that activity to our overview, although we are uncertain at this point if it is to be included in our project or not. If some measure, like the time required per delivery, is mentioned we often make a note on our diagram to suggest what we will want to measure. All this results in a very simple diagram that captures the overall process, the major inputs and outputs, and any important subprocesses or measures, as illustrated in Figure 8.10. We are not defining a formal notation or a vocabulary for this type of diagram. The key here is to simply get a rough but useful overview of the elements in the process, as it is currently understood.

As the high-level diagram of the process is developed it is shared with everyone involved in the project, and management is asked: Does this describe the process we are to improve? Should we consider the maintenance of delivery trucks? Should we look at problems with the phone system? Should we consider the food preparation process, or only the delivery scheduling and delivery activities? Our goal at this point is not to get into any detail, but simply to determine what management wants us to study.

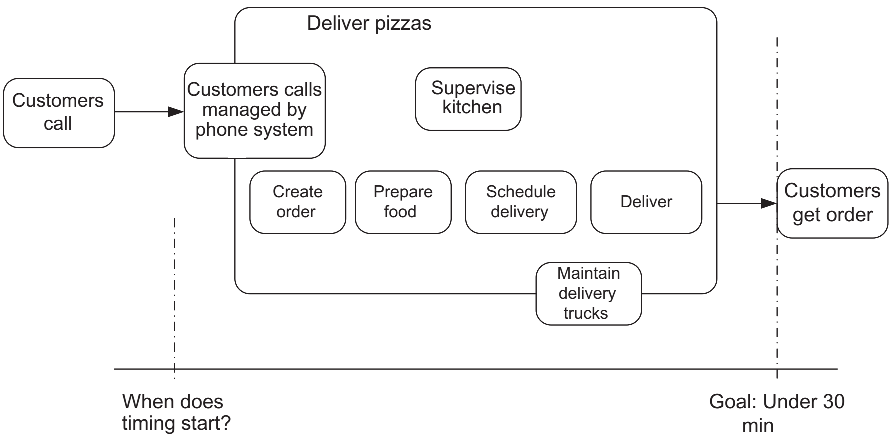


FIGURE 8.10

Diagram of the *deliver pizzas* process that includes some detail.

Keep in mind that management might not have considered all the implications of their request. They may assume that the problem is in the scheduling of deliveries, and not realize that it is the frequent lack of available vehicles that makes scheduling so inefficient. We start by determining what management *thinks* the problem is and then we proceed to gather more information to determine if their understanding is probably correct, or if it will make sense for us to suggest changing the scope of the project in some way. Once we have an initial description of the problem we talk with people involved in the process to refine our understanding of the process and to identify likely problems. In all cases we are seeking to refine our understanding of the measures of the As-Is process, of the actual inputs, steps, and outputs of the process, the causes of whatever specific problem that management has asked us to eliminate, and of any other problems that prevent the process from functioning as well as it might.

Stakeholders

As you gather information from senior management about the process to be changed you should also be developing a list of all the stakeholders who have an interest in the process. Stakeholders will include customers, suppliers, managers, employees, and anyone managing a process that interacts with the process you are going to try to change. During the analysis phase of the project you will want to interview all the stakeholders (or at least representatives) to ensure that you understand how they view the process and its problems.

Refining an Initial Process Description

Once you have a basic description of the problem process, represented as either one process that needs to be changed or as a process with four to five subprocesses that need to be improved, you are ready to refine your understanding of the process, the scope of the problem, and the specific nature of the problems you will need to deal with.

Now you are ready to interview a number of different stakeholders, including customers, employees, and day-to-day managers.

At this early stage we often find it useful to create a process scope diagram. Later, once we understand the problem better and as we begin to refine our analysis of the problem, we usually move to a process flow diagram. In essence, a process scope diagram helps you analyze the relationship between a given process and its environment. A process flow diagram, on the other hand, looks primarily at the internal workings of a given process. When you are just starting to try to figure out what might be wrong with a process a scope diagram is much more powerful than a flow diagram.

In this chapter we will consider process scope diagrams in some detail. In the next chapter we will move on to process flow diagrams. The basic ideas behind the process scope diagram originated with the structured software analysis modeling technique, called Integrated Definition (IDEF) language, which was originally developed by the US Air Force and which proved popular with computer-assisted software engineering tool vendors in the late 1980s. Most of the elements in IDEF are too technical to be of interest to business modelers, although elements of other IDEF diagrams are still used by software engineers. The idea of analyzing and scoping a process within a *box*, however, has been developed and popularized by Roger Burlton and his associates at the Process Renewal Group (PRG) and is quite useful in business analysis.

The basic diagram is referred to in the IDEF literature as a function box. Burlton refers to it as an IGOE (inputs, guides, outputs, and enablers) diagram. We'll refer to it, more generically, as a process scope diagram and develop it somewhat beyond its use by either IDEF or PRG. In essence, we create a diagram, like the one shown in the upper right of Figure 8.11, and then place the process or processes we intend to analyze in the center of the space, which we call the process area. The area to the left of the process area is reserved for information about inputs to the process or processes in the problem area. The area to the right of the process area is reserved for outputs from the process or processes in the problem area. The inputs and outputs can link the process in the process area to individuals, documents, products, systems, organizations, or other processes. To keep things clear we often use little figures for people, rectangles for organizations or systems, and rectangles with rounded corners for processes.

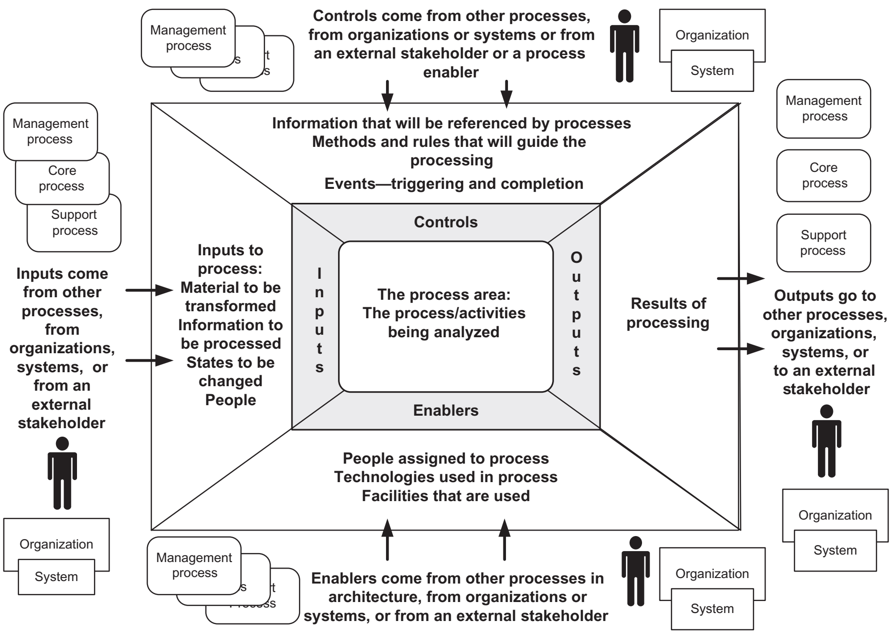


FIGURE 8.11

Elements of a process scope diagram.

The area above the process area is for guides or controls, which can be individuals, organizations, systems, documents, or processes that manage, constrain, or control the activities of the processes in the process area. The area below the process area is where we enter information about the support or enabling processes, systems, individuals or resources that support execution of the process. It sometimes helps to remember that the inputs are consumed by the processes, modified, and turned into outputs. The controls and the enabling "inputs," on the other hand, are reusable resources that are used over and over again. Figure 8.11 provides a more detailed look at the kinds of issues that we are concerned with when we create a process scope diagram.

Readers more familiar with cause-effect diagrams (which are also called Ishikawa or fishbone diagrams) might prefer to do their process analysis with one, which can represent the same information (see Figures 8.12 and 8.13). We prefer the process scope diagram partly because it seems to provide more space in which to record information and because it lets us show how we might change the scope of the project. In our experience cause-effect diagrams work better for smaller problems, while larger problems require more space simply because there are more problems and more opportunities to make improvements. Thus we use a process scope diagram to show the overall context of a given process. If we have one problem—say, customers complain about the delivery time—we might do a cause-effect diagram to explore why deliveries are slow.

If we were to use a process scope diagram to analyze the *deliver pizzas* process, we would begin by labeling the center box of the process scope diagram: *deliver pizzas*. We might also insert a list of some of the subprocesses that we have agreed are definitely included in the *deliver pizzas* process. Then we would begin to make notes in the process area or in the areas surrounding the process area. These notes would reflect things we found out about the process when we interviewed individuals involved with the process. In essence, the process scope diagram reminds us of the

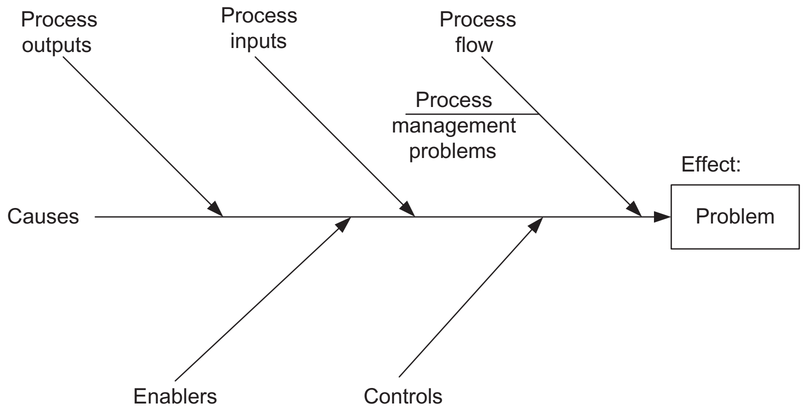


FIGURE 8.12

Cause-effect figure with prespecified cause categories for scoping.

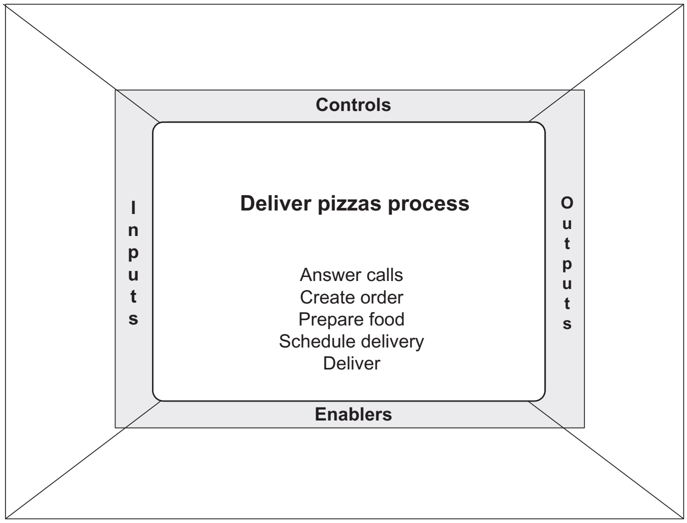


FIGURE 8.13

Process scope diagram with the process area filled in.

types of problems we might encounter in analyzing any process and provides us with space to make notes about actual problems we encounter. Thus the diagram provides room for information about relationships between the process-in-scope (in the process area), other processes, documents, or individuals, or what flows between them. At the same time, considering these relationships, we are able to focus on four of the six generic types of process problems we typically encounter, including:

1. Output problems
2. Input problems
3. Problems with controls
4. Problems with enablers

We will leave the other two generic types of process problems (5. Process flow problems and 6. Day-to-day management problems) until we consider the internals of the process in the next chapter.

Output Problems

Output problems result when the "customer" of the process is not getting what is expected. It is possible the outputs are unrealistic or unnecessary and should be changed, but, as things stand, if the quality, quantity, or timeliness of the outputs of the process-in-scope are not satisfying your customers you have problems. Keep in mind that "customers" can be other processes.

Similarly, there can be other stakeholders who have an interest in the outputs of a process. Thus, for example, local government regulators might be interested in outputs that do not meet local food service laws. Similarly, delivery service employees might be stakeholders if the delivery schedule required them to exceed speed laws to make the required deliveries in the time allowed. Outputs can take different forms, including physical entities, information or data, or decisions/approvals.

1.1 Quality of Output

- Output is rejected by a quality control process downstream (number, ratio of rejects).
- The downstream process refuses to accept output from the process-in-scope.
- Output is returned (ratio of returns to output).

1.2 Quantity of Output

- The process does not produce the number of outputs required.
- The process cannot scale down quickly when a decreased number of outputs are required.
- The process cannot scale up quickly when an increased number of outputs are required.

1.3 Timeliness of Output

- Some or all of the needed outputs are not produced when required.

In the case of our pizza example the obvious customers are the individuals ordering pizzas.

Input Problems

This type of problem results because the "suppliers" of the process-in-scope are not producing what is needed by the process-in-scope. Suppliers can include companies, individuals, or other processes, and "inputs" can include things, information, money, or even temporary employees. As with output, inputs to the process-in-scope can be deficient in quality, quantity, or timeliness. Similarly, inputs can take different forms, including physical entities, information or data, or decisions/approvals.

2.1 Quality of Inputs

- Inputs are rejected because they do not meet the quality standards of the process-in-scope.
- Inputs must be returned to an upstream process or supplier (ratio of returns to input).

2.2 Quantity of Input

- The supplier does not produce the number of inputs required.
- The supplier cannot scale down quickly when a decreased number of inputs are required.
- The supplier cannot scale up quickly when an increased number of inputs are required.

2.3 Timeliness of Inputs

- Some or all of the needed inputs do not arrive when needed.
- Inputs arrive in batches and must be stored till needed.

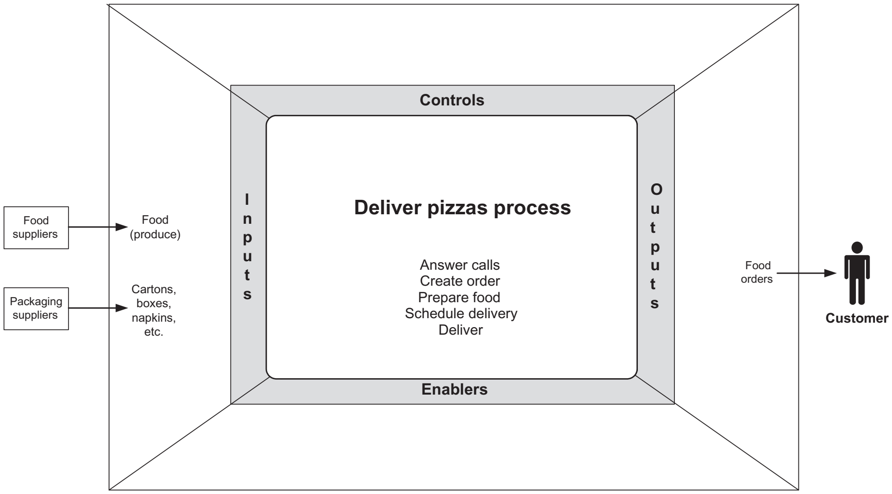


FIGURE 8.14

Process scope diagram showing some inputs and outputs.

Figure 8.14 shows a process scope diagram for the *deliver pizzas* process with some basic inputs and outputs.

So far we have described only some of the people and processes that generate inputs or accept outputs. Later we will list some of the specific problems that might occur in each section of the diagram.

Problems With Controls

Controls define or constrain how a process is performed. In most cases controls are created by higher level management processes and then released to the managers and employees of the process-in-scope. Thus, for example, a high-level management process generates a company strategy. Then higher level managers define policies and goals that are passed down to the day-to-day managers responsible for specific processes. Broadly, there are four general types of control problems: problems with the goals of the process-in-scope; problems with policies and business rules; problems with documentation, manuals, and other formal sources of control information; and problems with external management processes that either do not support the day-to-day managers or do not supply data, or require outputs that are incompatible with the nature of the process-in-scope.

3.1 Process-in-Scope Not Aligned to Organization or Value Chain Strategy
3.2 Problems with Policies or Business Rules
3.3 Problems with Documentation, Manuals, etc.
3.4 Problems with External Management Processes

In the case of our pizza process we know that there are a number of federal, state, and local laws that govern any business and many particular laws that regulate food preparation. All of these laws must be obeyed, and any management policy or business rules that contradict these external laws create an immediate problem. In addition, the company we are considering runs a number of different pizza stores, so we can be sure there are company-wide policies, manuals, and rules that define or constrain what local store managers can do. There are also, undoubtedly, goals set for local managers by the company management, which can generate a variety of problems.

Problems With Enablers

Problems with enabling or support processes arise when those processes fail to provide or maintain the resources needed by the process-in-scope. Support processes and problems can be divided into three or four broad categories. IT problems, HR problems, and facilities, equipment, and location problems are the most obvious. Some would also include problems with the gathering or production of accounting and financial data in this area, but others would consider it a control problem. It does not make too much difference where you consider accounting problems as long as they are handled consistently on your project scoping diagrams.

4.1 Employee Problems

- The process-in-scope is understaffed. HR cannot find or hire enough employees to adequately staff it.
- The jobs or roles defined for employees assigned to the process do not match the needs/requirements of the process-in-scope.
- Employees lack the skills needed to perform the work required to accomplish the process-in-scope.
- The employees have never been told who is responsible for various tasks that are part of the process-in-scope.
- Employees need training.
- The training provided is inadequate or offered at the wrong times.
- Manuals or other documentation do not offer complete or adequate guidance.
- The rewards or incentives provided for employees do not support the performance required by the process-in-scope. Worse, they actively discourage the correct employee performance. For example, the salespeople get bonuses for selling widgets, but get nothing if they spend time trying to sell the products generated by the process-in-scope.
- The employees lack the time, space, or tools required for performance of some of the tasks involved in the process-in-scope.
- The employees working on the process-in-scope are given lagging data, but no leading data that they can use to anticipate work, plans, schedule, etc.
- The employees believe that some or all the performance required by the process-in-scope is unnecessary, not properly part of their job, or should not be performed for whatever reason.

4.2 IT Problems

- IT applications require inputs or generate outputs that are out of sync with the actual flow and activities of the process-in-scope.
- Required or generated data are out of sync with the actual flow and activities of the process-in-scope.
- IT applications or tools require inputs or make outputs that are hard to impossible to interpret, and thus inadequate user interfaces lead to inefficiencies or errors.
- IT applications or tools support normal processing but do not adequately support exception handling, which is a special problem whenever the number of exceptions spike.
- Activities are performed manually that could be more efficiently performed by a software application.
- Data must be input more than once because the software applications being used do not share the relevant data.
- Data or reports provided to employees are inadequate, incomplete, or out of date.

4.3 Facilities, Equipment, and Location Problems

- Resources or tools required by the process-in-scope are unavailable when they are needed.
- The facilities are inadequate.
- The equipment is inadequate.
- The process-in-scope is geographically distributed and this causes inefficiencies.

4.4 Accounting and Bookkeeping Problems

- Bookkeeping requirements impose heavy burdens on the process-in-scope.
- Accounting information needed for decisions in the process-in-scope is not available or is not available in the form needed for the decisions.

Figure 8.15 illustrates a process scope diagram with some controls and support processes defined.

At this point we have described four major types of problems one can encounter and suggested some of the processes and individuals that might be associated with the *deliver pizzas* process. To further develop the example, in Figure 8.16 we have included a process analysis worksheet we prepared while talking with stakeholders in the *deliver pizzas* process. The worksheet lists some of the problems that we encountered. Figure 8.17 shows how we transferred the notes from our worksheet to the process scope diagram. We then went on to indicate how critical we thought different problems were. Obviously problem criticality depends on the goals of the project. Something that can be ignored in one project might become the central issue in a different project.

Finally, we added a bold line to the process scope diagram to suggest a revised scope for our project. Keep in mind that the initial scope was the process or processes and their associated day-to-day management processes that we placed in the process area of our initial diagram. In many cases that remains the scope when we

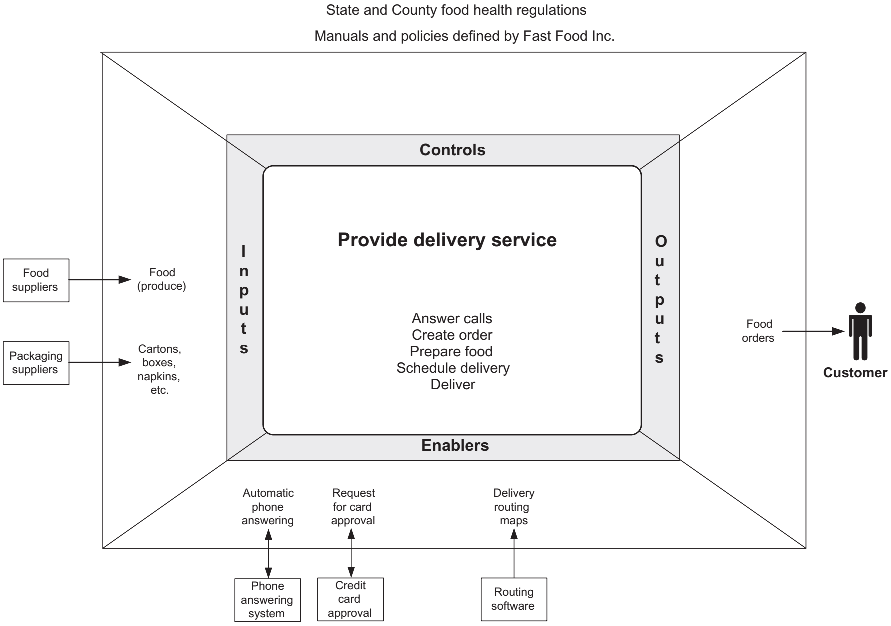


FIGURE 8.15

Process scope diagram defining some controls and enablers.

Provide delivery service					
Subprocess	Nature of activity	Manager	Employees	Measure of success	Problems?
Calls answered	Answering system answers calls and asks customer to wait for an available operator	Order supervisor	(Phone system)	(System answers each call within 10 s.)	System can tell customers of specials, but Supervisors often don't program system with new specials
Order created	Operator answers next call on queue, takes order, and asks how customer will pay (credit card or cash). If credit card, information taken and checked. Operator puts paper order on kitchen "rotator"	Order supervisor	From 1 to 5 phone order takers who sit at a phone with a head set and take orders	Each order taken within 3 min of call Each order written down correctly Only valid credit card orders processed	Supervisors don't have enough order takers Customers sometimes have to wait 4–5 min and some hang up
Food prepared	Food prep person takes next order from "rotator" and cooks or assembles food and then places it in a bag. Bag is placed in Delivery "window"	Kitchen supervisor	From 2 to 5 cooks	Every order processes within 4 min of receipt Each order prepared and packaged correctly Food packaged so it stays warm	"Continuously available items (e.g., French Fries) are re-set-up often enough and delays result while new batches need to be prepared Some order mistakes made Key supplies sometimes run out
Delivery scheduled	Delivery supervisor looks at order on each bag placed in "window," and determines location, prepares route sheets and groups deliveries in boxes, which are assigned to delivery people	Delivery supervisor	(No employees)	Orders clustered into routes that can be run in under 30 min	Sometimes there aren't enough delivery people available when orders "surge" Some routes take more than 30 min
Delivery undertaken	Delivery person takes route sheet assigned, loads boxes in truck and makes deliveries. Collects from all cash orders. Returns to store with cash and accounts with delivery supervisor	Delivery supervisor	From 2 to 8 delivery people	Routes run in 30 min Cash collected from all cash customers Delivery people are polite to customers All cash correctly accounted	Some routes take more than 30 min Some food delivered cold Some delivery people "brisk" Cash is sometimes not properly accounted

FIGURE 8.16

Worksheet with information gathered about the *deliver pizzas* process.

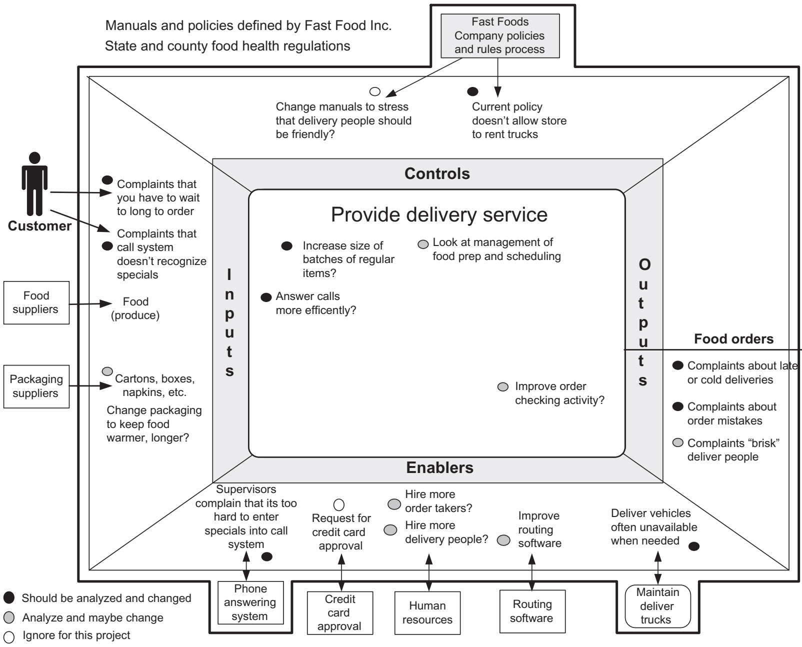


FIGURE 8.17

Process scope diagram with problems indicated by a *bold line* to suggest additional processes that should be included in the scope of the project to maximize the odds of a successful outcome.

finish the process scope diagram, and the diagram simply documents the relationships and the problems with the process-in-scope. In other cases, however, we may decide that a successful project requires that we expand our scope and analyze and redesign processes that lie outside the original scope, and the process scope diagram helps us document and explain why we would like to expand the scope of the project. Obviously an expanded scope will invariably require the consent of the manager who initiated the project and may require asking other managers who are responsible for other processes to become involved in the project. In some cases, for practical or political reasons, the scope of the project cannot be expanded. In those cases, however, it helps if everyone understands at the beginning of the project what limits are being imposed on the scope of the process change we will attempt. In a few cases the inability to expand the scope of a project strongly suggests that the project probably cannot be successfully undertaken and should not be pursued.

Different practitioners use process scope diagrams in slightly different ways. Some practitioners like to simply mention problem areas and then use bullets to suggest if there are problems in that area. Others do as we do here and suggest specific fixes to be considered. Some would list lots of additional processes that might be related to the *deliver pizzas* process. The important thing about the process scope diagram is its informality. It provides a way to gather and record information about all the possible problems you might encounter without requiring a formal definition about how processes are related or how policies are created or manuals are maintained. It is a very useful diagram when you are first trying to decide what will be included in a project and what kinds of problems you might encounter. In the next chapter we will begin to examine process flow diagrams. They provide a much more precise and detailed way to approach the analysis of processes and activities, but they also require a lot more time to ensure that they are accurate. The process scope diagram is useful precisely because it does not require precision, while simultaneously allowing the project team to capture all the different problems that might impact a project. And they provide a nice way of underlining when the scope of a project will probably need to be enlarged to ensure that the project team can meet the project goals established by management.

Creating a Business Case for a Process Change Project

To wrap up our discussion we consider what is involved in creating a business case for a business process change project. Different companies have different forms or approaches, but the essence of the task reflects the Gap Model that we discussed at the beginning of this chapter and the scoping effort we undertook when we developed the process scope diagram (see Figure 8.18).

One begins with a statement of the problem as defined by management. Next one refines the statement of the problem and describes the performance gap. One discusses measures that describe the current or As-Is process and one considers measures that would define an acceptable redesigned process. Then the business case ought to describe the capability gap, characterizing the current process and suggesting what kind of changes will be required to create a new process that will be able to generate the desired To-Be measures. One goes further and considers how one might study the gap and hints at the redesign techniques that might be used to eliminate performance and capability gaps.

At the end of the first phase of a project one can usually only define the capability gap in a general way and only suggest possible redesign options. Detailed study of the capability gap is the focus of the analysis phase of the project and the definition of possible redesigns is the work of the redesign phase. Even during the understanding phase, however, the project team has an obligation to try to define the likely changes that will be required. In some cases, even at an early point, the team can see where the effort is going to cost a lot more money or take a lot more time than management expects, and they have a responsibility to suggest this possibility. In such cases management might decide after the initial phase of the project that the project should be discontinued, at least for the present.

In a similar way, the business case produced at the end of the initial phase cannot be very precise, but the team should do the best they can to "guesstimate" the possible redesign possibilities and to assign some costs to each to provide management with an initial business case.

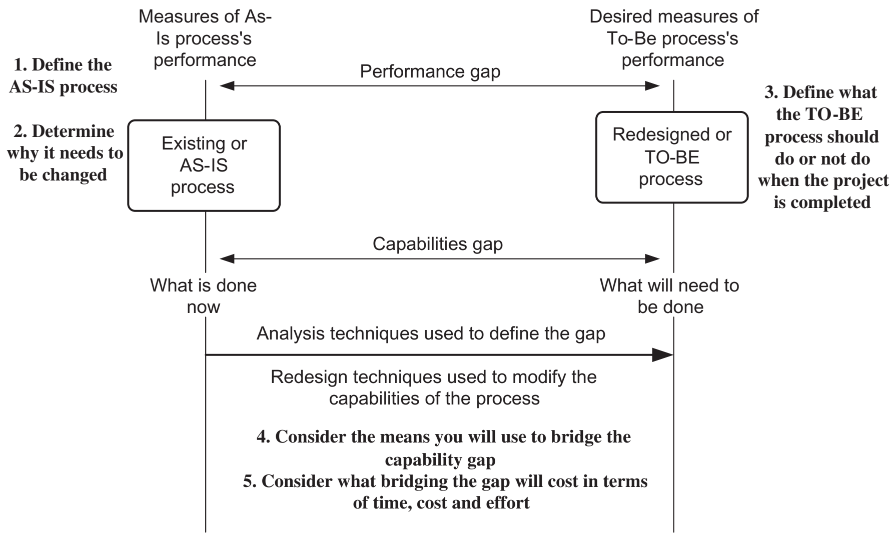


FIGURE 8.18

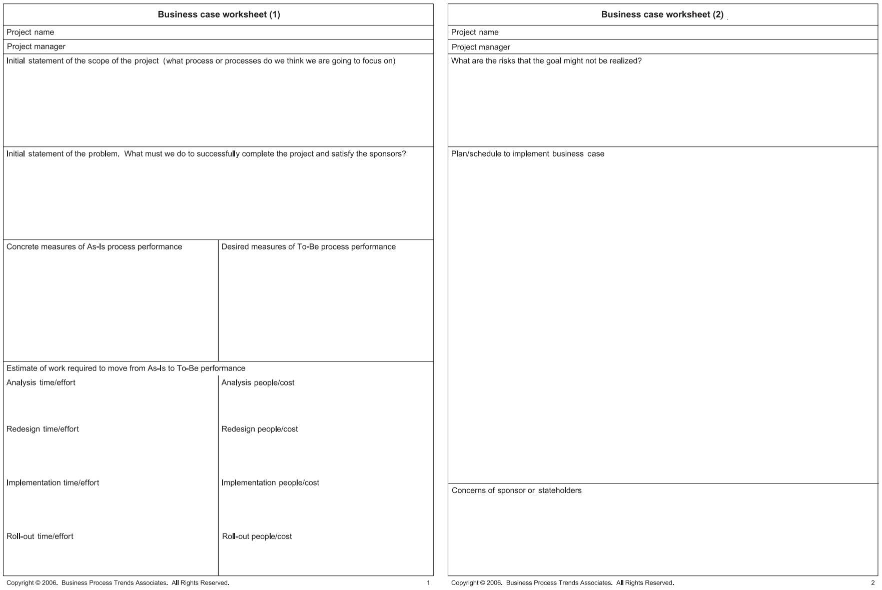
Gap Model provides an overview of a business case.

The steps in defining a preliminary business case include:

1. Define the As-Is process (what is in and out of scope).
2. Determine what the As-Is process is or is not doing now (concrete measures).
3. Define what the To-Be process should or should not do when it is completed (the goal of the project).
4. Consider the means you will use to bridge the capability gap.
5. Then consider what bridging the gap will cost in terms of time, cost, and effort.
6. Finally, consider the risks and the "politics" and revise if needed.

Here are some guidelines and an outline for a business case proposal:

- Keep it simple.
- State clearly: What is the problem?
- What process do we want to change?
- Why do we want to change it?
- Describe measures of the current situation.
- What is the objective or goal of the project?
- What would the new process be like?
- What measures would we expect of the new process?
- What is involved in creating the new process?
- Analysis and design
- Implementation
- Rollout
- What resources, time, and cost will be required to solve this problem?



Business case worksheet (1)

Project name

Project manager

Initial statement of the scope of the project (what process or processes do we think we are going to focus on)

Initial statement of the problem. What must we do to successfully complete the project and satisfy the sponsors?

Concrete measures of As-Is process performance

Desired measures of To-Be process performance

Estimate of work required to move from As-Is to To-Be performance

Analysis time/effort

Analysis people/cost

Redesign time/effort

Redesign people/cost

Implementation time/effort

Implementation people/cost

Roll-out time/effort

Roll-out people/cost

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Business case worksheet (2)

Project name

Project manager

What are the risks that the goal might not be realized?

Plan/schedule to implement business case

Concerns of sponsor or stateholders

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FIGURE 8.19

Worksheets for the development of an initial process change project business case.

- What risks or opportunity costs will be required?
- What results and what return should we expect from this effort?

The worksheets pictured in Figure 8.19 provide one way to structure the development of an initial business case. More detailed business cases are developed by following the same outline. When you finish the analysis and design phases, however, you will know much more about the specifics of the process and what it will cost to implement various changes and you will be in a much better position to recommend some changes and not others. At this point, however, you simply want to establish the overall scope and suggest what might be involved, the best case, and the worst case.

Notes and References

In this chapter I have not only drawn on ideas developed in discussions with Roger Burlton, Artie Mahal, and Mary Lowe as we worked on the BPTrends methodology, but also some ideas that were initially developed by PRG, Roger Burlton's company, before we began to work together on the BPTrends methodology.

Burlton, Roger T., *Business Process Management: Profiting from Process*, SAMS, 2001. This is the book Roger Burlton published in 2001 that contains many of the ideas used by PRG.

PRG's IGOE diagram was originally derived from work done in the early 1990s for the US Air Force. The software development methodology developed at that time included a business analysis methodology termed IDEF0. In December 1993 the Computer Systems Laboratory of the National Institute of Standards and Technology released IDEF0 as a standard for Function Modeling in FIPS Publication 183, a Federal Information Processing Standard. Two books that describe IDEF0 are:

Marca, David A., and Clement L. McGowan, *IDEF0/SADT: Business Process and Enterprise Modeling*, Electic Solutions, 1988.

Feldmann, Clarence G., *The Practical Guide to Business Process Reengineering Using IDEFO*, Dorset House Publishing, 1998.

CHAPTER

Modeling business processes 9

In Chapter 4 we considered how we might model all the high-level processes in an organization and store that information as a business process architecture. Once an organization has created a business process architecture, then any specific process change project becomes a matter of redefining or elaborating on a well-defined portion of the business process architecture. If a company has not created a business process architecture it often needs to model specific processes from scratch. In Chapter 8 we considered how you might begin such an effort by creating an informal model of a process to determine the scope of a business process. In essence, we treated the process itself as a kind of "black box." We didn't ask how it worked, but focused instead on how it reacted with people, systems, and processes that lay outside the process we were focusing on. In this chapter we are going to consider how one creates a formal model of a business process. We will consider techniques that can be used to model anything from a small process to a complex value chain.

In essence, at this point we are going to look "inside" the process that we pictured in our scope diagram in the previous chapter. Before we turn to formal flow diagramming, however, let us consider the other two types of process problems that we are interested in analyzing.

Figure 9.1 shows a process scope diagram with the five subprocesses we initially identified as those contained within the *deliver pizzas* process. We have connected the five processes into a flow diagram. *Flow problems* occur because some of these subprocesses are poorly designed or because the flow is not the best possible sequence. In addition, each of the processes has a manager or supervisor who is responsible for the work that goes on within that subprocess. *Process management problems* occur because one or more of the managers assigned to plan, organize, monitor, and control the subprocesses is not doing his or her job as well as possible.

In essence, every process or activity should have someone who is responsible for ensuring that the process or activity is accomplished. This process manager may be a team leader, a supervisor, or a manager who is responsible for several other activities, including this one. It is the manager who is responsible for ensuring that the process has the resources it needs, that employees know and perform their jobs, and that employees get feedback when they succeed or when they fail to perform correctly. It is just as likely that a process is broken because the manager is not doing his or her job as it is that the process is broken because of the flow of activities or the work of the employees.

Business Process Change. https://doi.org/10.1016/B978-0-12-815847-0.00009-1

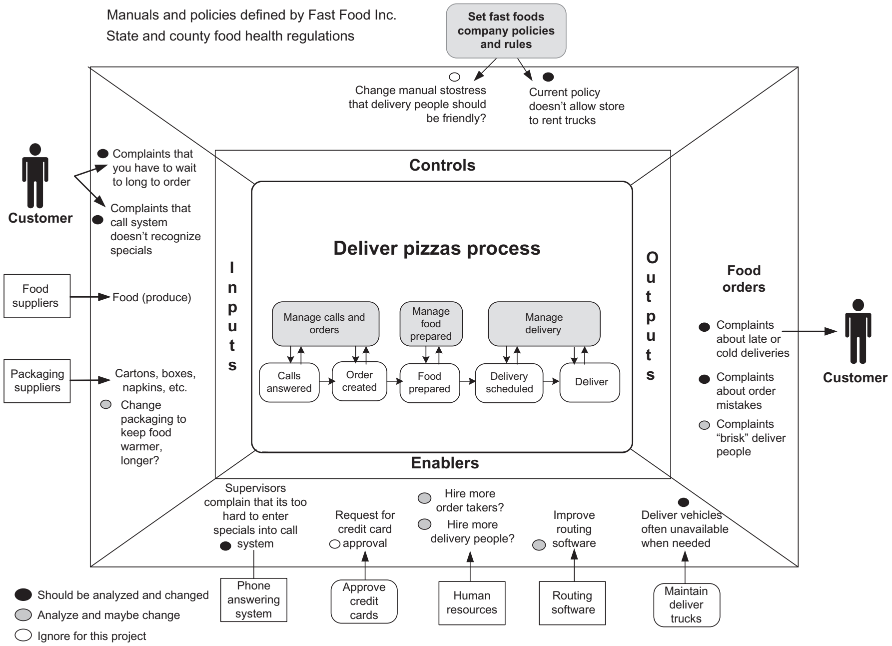


FIGURE 9.1

Management and flow problems on a scope diagram.

Process Flow and Process Management Problems

We considered four of the six process problem types in Chapter 8. Here we begin with the fifth type of problem and consider the flow of the subprocesses or activities of the process. We typically develop a flow diagram to ensure we understand the subprocesses and the flow between them, and we ask everyone involved in the process several questions to explore the following possibilities.

5.1 Problems with Logical Completeness

- Some activities are not connected to other, related activities.
- Some outputs have no place to go.
- Some inputs have no place to go.

5.2 Sequencing and Duplication Problems

- Some activities are performed in the wrong order.
- Some activities are performed sequentially that could be performed in parallel.
- Work is done and then put into inventory until needed.
- Some activities are performed more than once.
- There are no rules for determining or prioritizing flows between certain activities or individuals.

5.3 Subprocess Inputs and Outputs

- The inputs and outputs of subprocesses are wrong or inadequately specified.
- Subprocess inputs or outputs can be of inadequate quality, insufficient quantity, or untimely.
- Subprocesses get inputs or make outputs that are unnecessary.
- Some subprocesses do things that make for more work for other subprocesses.

5.4 Process Decision Making

- The process-in-scope, or one of its subprocesses, is called on to make decisions without adequate or necessary information.
- The process-in-scope, or one of its subprocesses, is required to make decisions without adequate or complete guidance from the value chain or organization (e.g., decisions are being made without stated policies or without specific business rules).

5.5 Subprocess Measures

- There are inadequate or no measures for the quality, quantity, or timeliness of subprocess outputs.

Subprocess measures are lagging measures and do not provide the process manager or other employees with the ability to anticipate or plan for changes in pace or flow volume. Keep in mind that we will explore all these issues in greater detail as we proceed with our process analysis effort. During the initial scoping phase we are simply trying to get an overview of what could be wrong with the process. At this point we are looking for problems that stand out and that will clearly have to be addressed if we are to eliminate the gap between the existing process and the process that management wants. Figure 9.1 shows our process scope diagram with the *provide delivery service* process, subdivided into five subprocesses, pictured in the process area. It also shows the three management processes that control those activities.

Day-to-Day Management Problems

We also consider how the process, as a whole, and each of its subprocesses or activities are managed. Some of the questions we ask when we consider if there are problems with the day-to-day management processes include the following:

6.1 Planning and Resource Allocation Problems

- The process manager working on the process-in-scope is given lagging data, but no leading data that he or she can use to anticipate work, plans, or schedule.

6.2 Monitoring, Feedback, and Control Problems

- The employees working on the process-in-scope are not held responsible for achieving one or more key process goals.
- The employees working on the process-in-scope are punished for pursuing one or more key process goals.

- The employees working on the process-in-scope are not given adequate information about the performance of the process he/she is responsible for managing.
- The employees working on the process-in-scope are given lagging data, but no leading data that they can use to anticipate work, plans, or schedule.
- The employees working on the process-in-scope are either not rewarded for achieving key process goals or are punished for achieving key process goals (e.g., the employee who works the hardest to ensure that the process-in-scope meets a deadline is given more work to do).

6.3 Manager's Goals and Incentives Conflicted

- The process manager is trying to achieve functional/departmental goals that are incompatible with the goals of the process-in-scope.
- The process manager does not have the authority, budget, or resources required to effectively manage the process-in-scope.

6.4 Manager Accountability

- The process manager is not held responsible for achieving one or more key process goals.
- The process manager is punished for pursuing one or more key process goals.
- The process manager is not given adequate information about the performance of the process he/she is responsible for managing.

There is an important distinction between day-to-day process management and the more generic, higher level management processes that are included under controls. Thus, for example, a day-to-day manager is responsible for ensuring that employees know and apply the business rules that apply to a given process. In most cases that manager is not responsible for creating, maintaining, or changing the business rules. If the business rules are not being applied we focus on the day-to-day process manager. If the business rules are wrong or should be changed we are probably going to have to look at the higher level management process that sets policy and defines business rules.

Stepping back from our analysis of process problems, however, it is easy to see that the process scope diagram is fine for identifying external problems, but would rapidly become too complex if we tried to show the internal subprocesses and the flow in a single diagram. Thus we use a process scope diagram to define the relationships between a process and its external surroundings, and we use process flow diagrams to define internal relations.

Process Flow Diagrams

Formal process flow diagrams are often called process maps, activity diagrams, or workflow diagrams. Historically, process analysts have used a wide variety of different diagramming notations to describe processes. This is not surprising when you consider all the different groups that do process diagramming. In some cases business managers create diagrams just to figure out how a complex process works. In other cases a Six Sigma team will create a diagram as they prepare to focus on improving a specific process. In still other cases an IT group will create a process diagram as the first step in a project to automate a process.

The most important practical distinction in process modeling is between the relatively informal diagrams that business managers use to help them understand processes and the relatively formal diagrams that IT software developers use to specify exactly how a software program might implement the process. IT software diagrams can be complex and include details that business people are not interested in. At the same time IT people rarely consider large processes, like a corporate supply chain, that include many tasks that employees perform. We believe that companies that are serious about business process change need to create architectures and store information about processes in business process repositories. To do this everyone in the organization needs to adopt a standard notation and use it consistently. Most companies adopt the notation of the business process modeling tool that they use to manage their business process repository. Business process modeling tools can support a variety of different notations, including tailored variations to accommodate the special needs or preferences of individual companies. It is not so important what notation is used, but it is important that whatever notation is used is used consistently.

In the past few years a consensus on business process notation has begun to emerge. It began with diagrams introduced by Geary Rummler and Alan Brache in their popular 1990 book *Improving Performance*. The notation introduced in *Improving Performance* is usually called Rummler-Brache notation. The Rummler-Brache notation was further formalized in an IBM notation called Line of Vision Enterprise Methodology (LOVEM). Then some Rummler-Brache concepts were incorporated into the Object Management Group's (OMG) unified modeling language (UML) activity diagrams. In 2004 the Business Process Management Initiative (BPMI) group brought most of the major business process modeling tool vendors together to create a new notation—the Business Process Model and Notation (BPMN)—which is close to the OMG's activity diagram notation. In 2005 the BPMI organization merged with the OMG and the OMG is now working to ensure that BPMN and UML activity diagrams work smoothly together. Both UML activity diagrams and BPMN diagrams have large sets of symbols and can represent complex processes so precisely that the diagrams can be used to generate software code. This level of detail would overwhelm most business process modelers. BPMN diagrams, however, support a core set of diagramming elements and these core elements represent the emerging consensus and are rapidly becoming the standard notation supported by business process tools and by business process authors. We use the core BPMN notation throughout this book whenever we diagram complex processes, as we do in this chapter. In Appendix 1 we describe the core BPMN notation, and show some of the extensions that one can use with the core elements to create more complex diagrams.

The only major alternative to the approach we use herein is represented by the event-driven process chain (EPC) diagrams popularized by SAP and ARIS software tools. EPC diagrams are widely used by those who model processes in conjunction with enterprise resource planning efforts. Most business people find EPC diagrams difficult to understand, because they rely too heavily on concepts that are relevant for software development but irrelevant for most process redesign or improvement efforts.

Business people model to simplify, highlight, clarify, and communicate. Thus, any notation that makes things too complex is counterproductive. At the same time we want to enable different individuals within the same organization to read common process diagrams; thus we need to agree on a minimum set of conventions. We believe that the core set of BPMN notational elements provides the best that is currently available. On the other hand, when we find we want to express something that is not easily expressed in BPMN we feel free to informally extend BPMN to be sure we make our point as clearly as possible.

Flow Diagramming Basics

Figure 9.2 illustrates the basic elements in any process notation. A process is a set of activities that receives and transforms one or more inputs and generates one or more outputs. For the purposes of this discussion we are using process, subprocess, and activity almost as if they were synonyms. In creating diagrams we commonly decompose a process into its subprocesses. Then we refer to those subprocesses in turn as processes when we undertake further decomposition. And, informally, we speak of the processes making up any larger process as the activities of the larger process.

In BPMN a process or an activity is represented by a rectangular box with rounded corners. To simplify our explanations we will refer to this as a "process rectangle" or an "activity rectangle," which is a little simpler than always saying a "rectangle with rounded corners." In Figure 9.2 we show three process rectangles: one in the center; one upstream, which generates the inputs for the center process; and one downstream, which receives the outputs of the center process.

A process takes time. An event, on the other hand, is simply a point in time. Specifically, it is the moment in time when one process has concluded and generated an output. Or, looked at from downstream, it is the point in time at which an input becomes available for use by the downstream process. In some cases we say that events "trigger processes"—as when a customer calls to request service. Events are represented by circles. We often represent the initial event that triggers a process as

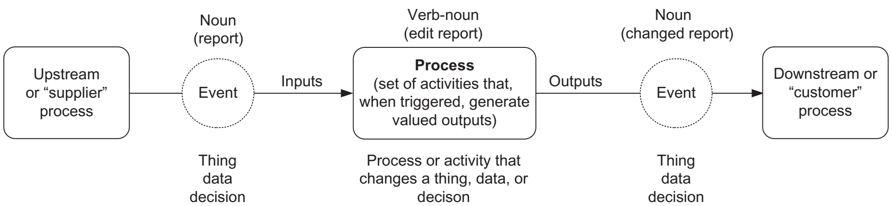


FIGURE 9.2

Basic elements in a process or workflow diagram.

a circle, and we usually include another circle to show that a process has concluded. We usually do not include events between activities within a process flow, although some analysts do.

In the real world, processes are occasionally arranged so that a series of processes follow one another without any time elapsing between them. In other situations one process will conclude and place its output in a bin, where it may wait for hours or days until it is removed by the subsequent process. Events are often described with names that describe the artifact that passes between two processes. Imagine the upstream process in Figure 9.2 assembles a set of documents, puts them in a tray, and places them where the center process can get them. We might term the upstream process "*assemble documents*." And we might term the output of that process "*assembled documents*." By the same token the inputs of the center process would be "*assembled documents*." Assume the center process reviewed the assembled documents and determined to make a loan or to refuse a loan. The output of the center process in this case would be "*approved/disapproved loan*." Another output might be "*documents to file*." We represent the flow of artifacts and decisions between processes with arrows. If we need to describe the artifacts or decisions we can write labels above or below the arrows. If we really needed to record a lot of data about the artifacts or decisions that occurred in a particular process we could insert an event circle between two process rectangles, although this is an uncommon convention.

Software systems that monitor human or other software processes usually store data when events occur. Thus if the people working in the upstream process are using computers they will most likely assemble the documents into a software file, and hit some key to "pass" the file to the next process. The software system monitoring the work will update its records as a file is moved from one process to another. Most business managers create models to understand processes. For their purposes process rectangles and arrows are important. Similarly, the nature of the artifact or decision being made may be important. Events are more important to software modelers who need to know when databases will be updated.

Figure 9.3 represents a simple BPMN diagram. Let's assume we have a process that does nothing but send brochures to customers who telephoned in and requested them. We picture two swimlanes: one for the customer and a second for the process. Within the customer swimlane we show two events: a circle that represents the telephone call that triggers the process and a second, thicker circle that represents the termination of the process (when the brochure arrives at the customer's mail box).

The second swimlane represents the process itself, which has two subprocesses (or activities): one that takes telephone orders and a second that addresses and mails brochures. Notice that when flow arrows cross the gap between the process and the customer swimlanes they are dotted lines. When they connect activities within the same process they are solid lines. In both cases we label the swimlanes on the left side to show who owns or is responsible for managing the activities that occur within the swimlanes. The customer is obviously responsible for the telephone call that triggers the process, and according to the diagram a functional group called *service operations* is responsible for the two activities that make up the process.

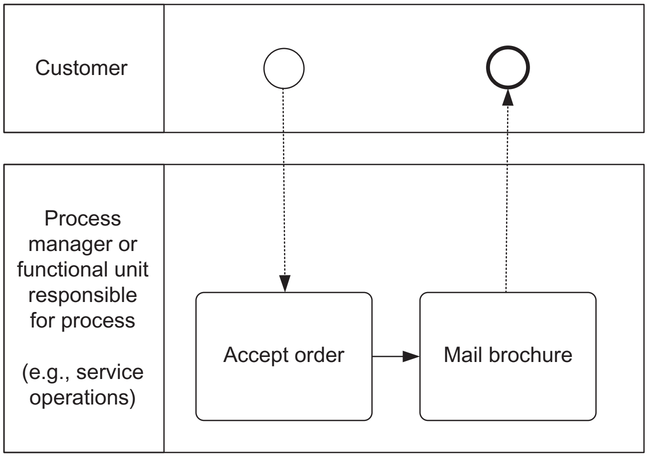


FIGURE 9.3

Simple Business Process Modeling Notation process diagram.

Figure 9.4 illustrates a slightly more complicated BPMN process diagram. In this instance we are focusing on a single, high-level order fulfillment process that begins when a customer places an order and ends when the product is delivered. In this case we have a customer swimlane, a pool of swimlanes that represent the core process, and a separate supplier swimlane. The fact that the supplier is separate simply reflects the fact that the company that manages the core process does not control the supplier. In this case several operational units are responsible for different activities that make up the core process and each, presumably, is managed by a different supervisor. In one case we have an activity that spans two units, and were it decomposed would presumably have activities managed by two different supervisors.

Let's consider the notation used in Figure 9.4. We already know that we can represent the core *order fulfillment* process by a pool of swimlanes. Within the various swimlanes the subprocesses of the *order fulfillment* process are represented by process rectangles. Processes are either labeled with abstract titles, like *manufacturing* process, or given specific names that normally begin with a verb, such as *manage leads*, *determine needs*, or *ship product*.

In our figures all the text that would normally appear on a BPMN process diagram is printed in Arial. We put explanatory notes in Times Roman to make it clear that they are only notes.

The *order fulfillment* process shown in Figure 9.4 is represented by a pool divided into a series of horizontal rows, which are called swimlanes. Although there are exceptions, as a strong generalization as you move from left to right on a diagram you move through time. Thus a process begins on the left side of the diagram and proceeds to the right, and activities on the left take place before activities on the right.

The top swimlane is always reserved for the customer of the process being described. If the process links to the outside world, then the customer is a real, external customer of the company. Otherwise, the top lane is reserved for whatever entity or process initiates the processes shown on the diagram. In most cases this will be the downstream or "customer" process. If there is more than one customer you can insert multiple customer swimlanes at the top of the diagram. Or you may want to show a "supplier" and a "customer" as the two top swimlanes. If the diagram pictures a lower level process it is common to omit the customer swimlane and simply insert a circle to represent the trigger that initiates the process in the same swimlane as the first activity.

Sometimes we represent the initial event that starts the process as an activity performed by the customer. At other times we simply represent the initial event as a circle, as we do in Figure 9.4. We use activity rectangles whenever we want to be more specific about what the customer does. We will return to this later when we consider another diagram.

All of the activities that occur within the same organization are represented as adjacent swimlanes. If the process being described is linked to an external activity, like the *ship parts* activity that is performed by a supplier in Figure 9.4, the external activity is placed in its own swimlane, which is separated from the company's process. In this case we refer to company activities as all occurring in the same pool of swimlanes, whereas the supplier's activity occurs in a single swimlane in a separate pool. Pools generally represent organizations that share control and data. Since the order-processing organization and the supplier do not share control and may or may not share data we create two pools, one with several swimlanes and one with a single swimlane.

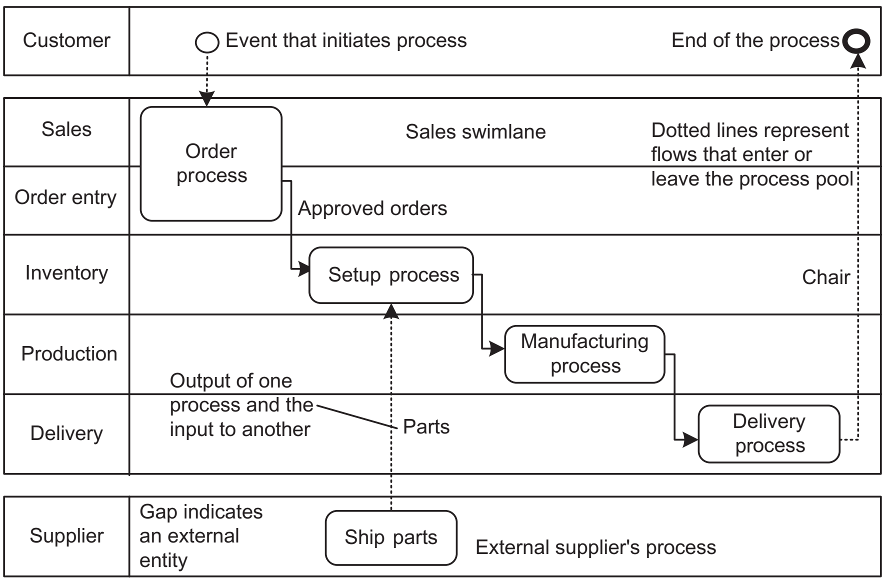


FIGURE 9.4

Basic Business Process Modeling Notation process diagram.

In some organizations a diagram similar to the one shown in Figure 9.4 might be called a workflow diagram. In a typical workflow diagram, however, we would simply represent all the activities, connected by arrows, but without swimlanes. In Figure 9.4, however, we want to show the functional or organizational units responsible for each of the activities. Thus the organizational departments or functional units are represented as pools or swimlanes. In some cases a swimlane will represent a department, in some cases it will represent a subsidiary unit within a department, and in some cases it will represent the process manager who is responsible for the activities within the given swimlane. Figure 9.3 shows that there is an inventory department and that the inventory department is responsible for the *setup* process. Put a different way some manager or supervisor within the reporting hierarchy of the inventory department is responsible for the *setup* process. If the process being described is a high-level process we usually just show departments. As we drill down and focus on more specific processes or even on specific activities we tend to get more specific about who is responsible for the subprocess or activity.

A formal process flow diagram, as we will use the term, is a workflow diagram with swimlanes. As far as we know this approach to process diagramming was originated by Geary Rummler and Alan Brache, but it has since been adopted by a wide variety of business process modelers, including the OMG, which uses swimlanes with both UML activity diagrams and BPMN diagrams.

If we analyze large-scale processes, as we are doing in Figure 9.4, it is possible that a process will be the responsibility of more than one functional group. Thus both *sales and order entry* are responsible for activities that occur within the *order* process. If we analyze the *order* process in more detail, however, we will need to determine just which activities *sales* is responsible for and which activities the *order entry* group performs. We allow ourselves to spread a given activity across more than one swimlane when we create high-level diagrams, but confine activities to a single lane as we refine our understanding of the process.

As you can see by glancing at Figure 9.4 we can either label arrows or not, depending on whether we think the information useful.

We usually do not represent three levels of processes on the same diagram. The diagram itself is one process, and we use process rectangles to show the major subprocesses of the single process represented by the diagram itself. In other words, we do not include process rectangles inside other process rectangles. It can certainly be done, and it is sometimes useful when you are trying to analyze processes at a high level of abstraction, but it is usually too confusing. Instead, we represent several processes or activities that are all at more or less the same level of granularity. We usually analyze high-level processes on an organization diagram and then create a diagram, like Figure 9.3, to define the major subprocesses within one process we identified on the organization diagram. The key point, however, is that if you want to know what goes on inside the *order* process you create a second process diagram with the *order* process on the title line and subprocesses within the swimlanes.

As we drill down the functional groups listed on the swimlanes keep getting more specific. In effect, we are moving down the organizational chart. Initially, we label swimlanes with department names. At a finer level of detail we may only show two departments, but subdivide each of the departments into several functional units. If we continue to drill down we ultimately arrive at swimlanes that represent specific managers or specific employee roles.

Figure 9.5 provides an overview of the way in which someone might drill down into a process. This figure shows how we use organization diagrams and charts as a way of gathering the information that we later use when we create process diagrams.

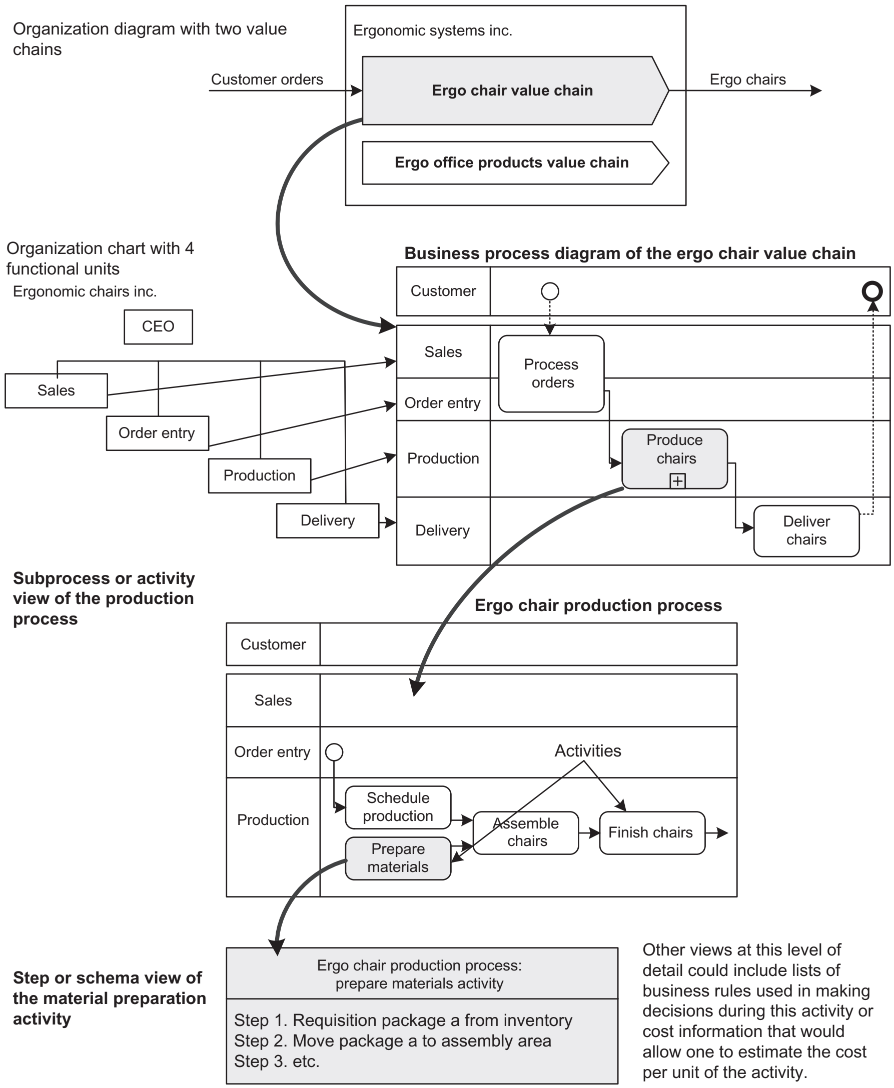


FIGURE 9.5

Drilling down into a process to examine more specific levels of processes.

In effect, the departments identified in the organization chart become the swimlanes for a process diagram, whereas the organization diagram suggests which processes we might want to analyze further.

On the initial organization diagram we show two processes: two value chains. We decompose one of the value chains into three major subprocesses, which we subsequently define in more detail. The plus in a box at the bottom center of the *produce chairs* process rectangle is placed there to remind viewers that a more detailed subprocess diagram is available for that process.

In Figure 9.5 we assume that *prepare materials* is an atomic activity. In other words, for the purposes of our analysis we are not going to diagram anything that occurs within the activity box labeled *prepare materials*. That is not to say that we will not gather additional information about that activity. We simply are not going to create a diagram to describe the sequence of steps that occur within *prepare materials*. Instead, we might create a textual description of the activity involved in materials preparation. If we want a finer definition of the process we might type out a list of steps that occur during accomplishment of the activity. We will certainly want to know if the activity is performed by humans or by computers or machines, or some combination of them. Similarly, if we are planning on doing simulation we might accumulate information on the type and number of units processed in the activity, the costs per unit, and the time required per unit. If you are doing this by hand you could simply write down the information on a sheet of paper and attach it to the diagram.

Later, we will provide an activity worksheet that you can use to prompt yourself in accumulating data you might need to record for an activity. If you are using a sophisticated software tool, when you click on an activity box it opens and provides you with a worksheet in a window, and you can type in the information on your computer.

More Process Notation

In addition to the symbols we have already introduced, there are a few more a manager must know to read process diagrams. Figure 9.6 illustrates another simple process. In this figure we are looking at a process that describes how a retail book company receives orders by telephone and ships books to customers. This company does not manufacture books; it simply takes them from its inventory and sends them to customers.

Some of the symbols in Figure 9.6 are new and others are simply variations. For example, instead of starting with a circle, we placed information inside a box that indicates that the customer placed an order. We are not concerned with what process the customer goes through in deciding to order the book, although we might be and will return to the concept of a customer process in a bit. From our perspective the placement of the order is an event or stimulus that triggers the *book order fulfillment* process. Hence the customer's action is handled in a special way.

Some activities are well-defined procedures, whereas others involve the application of rules and decisions. *Review order* is an example of a process or activity that requires a decision. If the decision process is complex we record the decision criteria

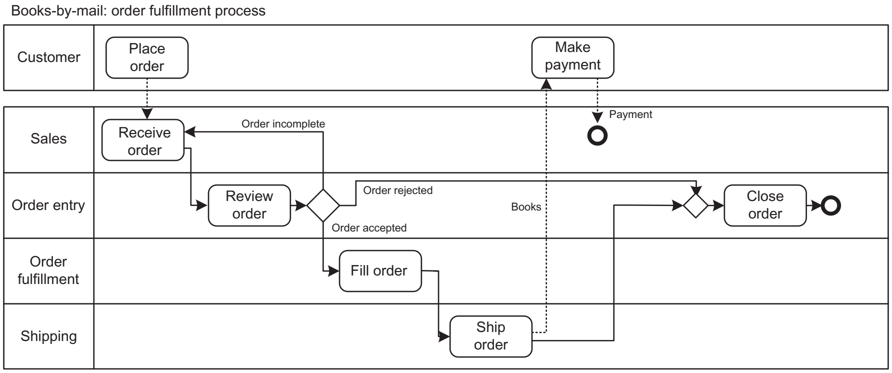


FIGURE 9.6

Another simple process diagram.

as one or more business rules and write the rules on a separate piece of paper, or record them in a software tool that associates them with the activity.

Business rules take this generic form:

IF<something is the case>
AND<something else is also the case>
THEN<do this>
ELSE<do something else>

For example, we might have a rule that said:

IF the order is from a customer we do not know.
AND the order is over $50.
THEN check the credit card number for approval.
OR wait until the check clears our bank.

Complex decision processes can involve many rules. In extreme cases there are too many rules to analyze, and we rely on human experts who understand how to solve the problem. We will consider this entire topic in more detail when we discuss how activities are analyzed in Chapter 10.

In some cases, as in the example shown in Figure 9.6, the decision is relatively simple and different activities follow, depending on the decision. We often place a diamond or gateway after the activity that leads to the decision. We indicate the alternative outcomes as arrows leading from the diamond to other activities. In the example shown in Figure 9.6 the order can be either:

- *rejected*, in which case the order is terminated; or
- *accepted*, in which case the order is passed on to shipping and invoicing.

In most cases a small diamond is sufficient, and outcomes are simply written by the arrows leading from the decision point.

In some cases you may want to describe the decision point in more detail. In that case you can expand the diamond into a hexagon. This is done as shown in Figure 9.7, which is a slightly more complex version of Figure 9.6. Here we have three arrows coming from the first gateway. Notice that we show one arrow running *backward in time* in Figure 9.7 as it goes from the decision point back to the *receive order* activity. This should not happen too often because it runs counter to the basic idea that a process diagram flows from left to right. On the other hand, it is sometimes useful to show *loops or iterations* like this rather than making the diagram much larger. We refer to it as a "loop," because we assume that once the salesperson has called the customer and completed the order it will proceed back to the *review order* activity just as it did in the first instance. Most business analysts ignore the "exceptions" when they prepare their initial diagrams. Most business people do not need this level of detail, although software systems analysts do need to understand all possible outcomes. Some analysts prepare tables to describe decision situations and list all the possible outcomes. For example, what if an order form arrives and the company name is misspelled or a signature is left off?

Notice the second use of a decision diamond on the right side of Figure 9.7. In this case the diamond has two inputs and only one output. In effect, the diamond says in this instance that the order is going to be closed because EITHER the order was rejected OR the order was shipped and paid for. The diamond in this second case is simply a graphical way of saying there are two different possible inputs that can trigger *close order*. The *close order* activity takes place whenever either one of the inputs arrives.

At this point we need to decide just how much information we need to record in this diagram. BPMN defines a core set of symbols, and then defines elaborations. To make it possible to use the same diagram to show either a simple overview or to include more complex information BPMN extends its core symbols. Thus, for example, any event can be represented by a circle. A circle drawn with a line of average width that appears at the beginning of a sequence, however, represents a trigger that starts a process. A circle drawn with a bold line represents the end of a process. By putting various symbols inside the circle it can be refined to represent a variety of different event types. Similarly, we can use a simple diamond to represent any of several different gateway or decision situations. Without any special notation the diamond simply shows that the flow is diverging or converging. With adornments the diamond can represent different flow conditions.

Some analysts will find these refinements useful and we may use them later in special cases, but in general we stick with the core notation and simply use a diamond. In Figure 9.7 we use two parallel diamonds and two decision diamonds, but only mark the parallel diamonds.

In effect, diamonds allow analysts to indicate the basic logic of business flows. In most cases, when you are creating an early draft of a workflow, you avoid such logical subtitles. Thus, for example, we could have shown the flow from *fill order* to *ship order* and *send invoice*, as shown in Figure 9.7.

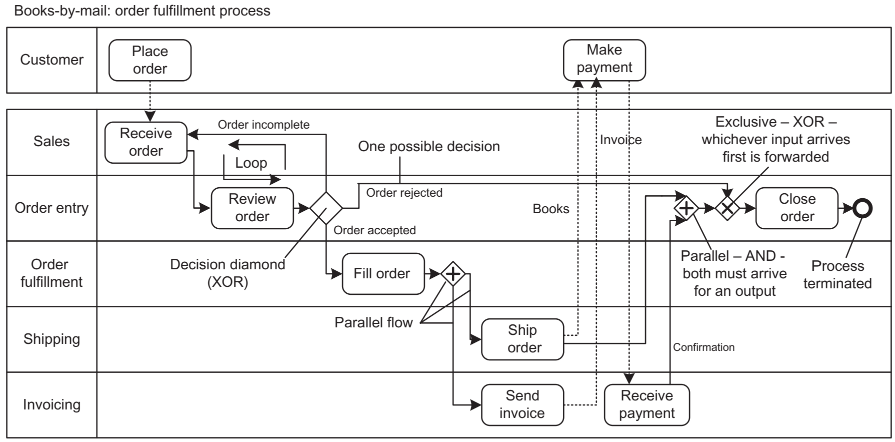


FIGURE 9.7

Still another simple process diagram.

These two alternatives do not tell us anything about the logic of the flow. It might be sufficient if the information from fill order only arrived at ship order, for example. It might be that different forms were sent to ship order and to send invoice. If the second we would probably label the arrows to tell us what went where. The point, however, is that you can define processes informally at first and then refine the flow to capture business rules or procedural logic as you refine the diagram.

Consider the two arrows leaving ship order in Figure 9.7. In one case the arrow represents an object or thing—books. In the second case the arrow represents information—a confirmation—sent to the person responsible for closing orders. Some analysts use different arrows to denote the flow of information and things. We do not and prefer to simply label the arrows. This usually works well enough for simple business diagrams.

Finally, from the *close order* activity an arrow leads to a terminal event: a bold circle. This symbol indicates that the process ends at this point. Sometimes, we also use the end point to indicate that we do not want to pursue a given workflow any further. Thus, for example, rather than use the second diamond and create that complex bit of logic just before the *close order* activity we might have simply let the arrow labeled "order rejected" lead to an end point. If we did it would be because we thought that what happened next was obvious and we did not want to clutter the diagram by showing the flow of that output of Review Order. (BPMN uses a double circle, one inside the other, to indicate that a flow is incomplete and continued elsewhere.)

Figure 9.8 introduces some additional symbols that you may find useful. In this case we are considering a simple process that involves letting customers order books via the Web. Thus, the two swimlanes below the customer swimlane describe an automated process. In this case other than clearly labeling them as software applications there is no essential difference between activities performed by an employee and

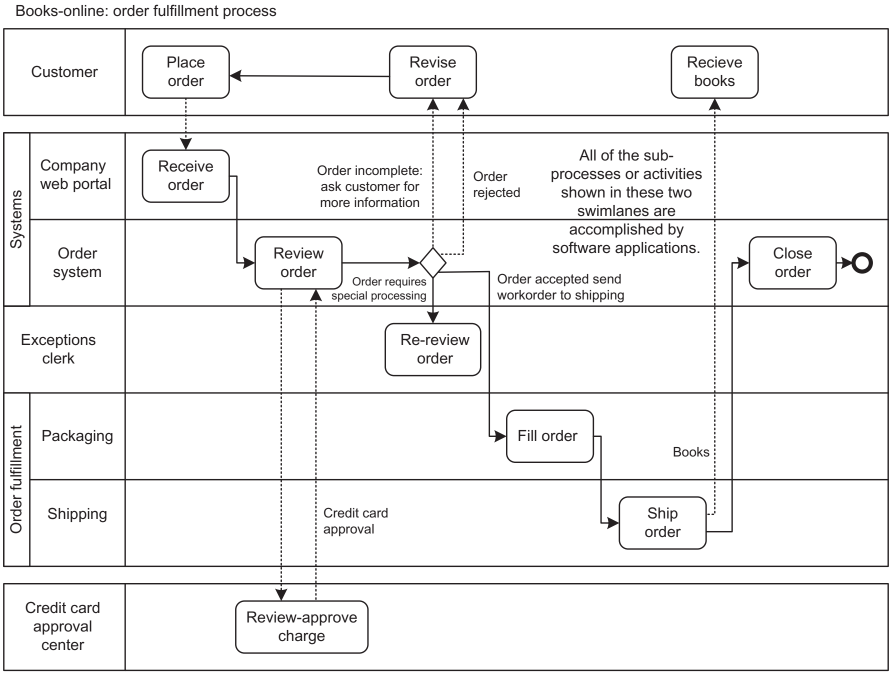


FIGURE 9.8

Some additional process-diagramming techniques.

activities performed by a software application. Indeed, in initially analyzing a process it is best to ignore how the process will be performed and focus instead on defining what needs to be done. Later, as you focus on how specific processes will be done, you will probably introduce variations to better accommodate the employees or the system, but at a high level of abstraction; it is simply work that needs to be done to satisfy customers.

We have also used two types of labels to identify some of the swimlanes. Both the web portal and the order system are systems. (We are avoiding the issue of whether this is a departmental-based IT group or the enterprise IT organization at this point.) Both the packaging group and the shipping group report to the order fulfillment department at Books-OnLine. By representing it as we have we show some of the departmental structure or the management reporting relationships.

Most analysts make distinctions between individuals, jobs, and roles. In most cases when we speak of an activity we speak of a role. It is something one or more people do. It may or may not be a complete job. Imagine that there are six exception clerks. There is one job description for exception clerk and six individuals have been hired to do the job. Next, imagine that there are 10 different activities, or roles, that are included in the exception clerk job description. One of the activities, or roles, is to rereview orders that are listed on the special processing report generated by the order system in conjunction with the web orders. Another role might be to handle errors generated by an accounting system. In other words, the job of the exception clerk is larger than the *rereview order* activity. Thus, we speak of the abstract unit of work required by the *rereview order* activity, which could be done by any one of the six exception clerks, as a role.

Similarly, we might have a process that includes an activity that requires the approval of the VP of marketing. We might show the VP of marketing on a swimlane. Again, we would not be referring to an individual because the person holding the job might change. We would simply be referring to the job or role.

Notice that Figure 9.8 shows that the exception clerk handles orders that require special processing. In this case we did not want to follow the various flows that might come from the *rereview order box*. If we did we would have inserted a small box with a plus in the activity rectangle and then developed another process diagram to capture the details. You can ignore this in some cases, but it is often useful to remind readers that they can go to another diagram to obtain more detail.

Figure 9.9 provides a few more variations. In this case we are looking at a small part of an auto claims process. Here we do not show the customer, but simply begin with a claims agent submitting a claim.

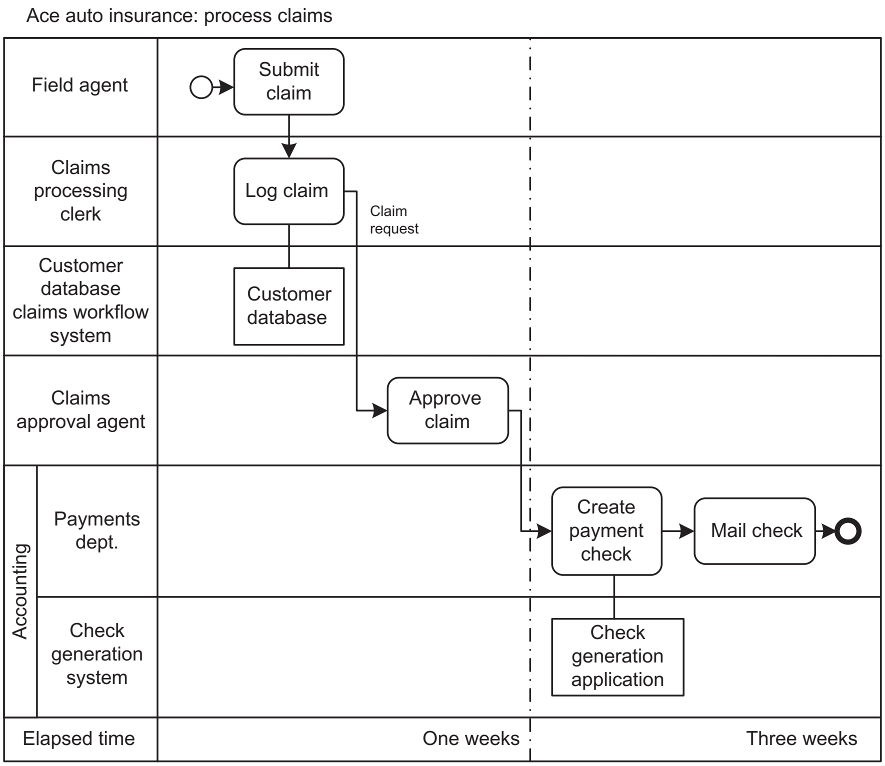


FIGURE 9.9

Additional symbols.

When the claim arrives a claims processing clerk enters the claim into the customer database. We show a software application/database in a swimlane, representing the unit that owns or maintains the database—probably the IT group. We picture the software application itself as a square-cornered box and connect it to the activity box with a line without an arrowhead. The application is not an activity as such, but a tool—like a file cabinet—used by the *log claim* activity. Because it is often important to keep track of software applications and databases, however, we frequently represent them on our process diagrams. In a similar way, the employees in the payments department use a check generation application to actually generate the checks they mail to customers.

We added a special row at the bottom of the process diagram shown in Figure 9.9 to indicate the time involved. In this example we assume that the company wants to get all claims processed within 1 week of receipt and that it wants to pay accepted claims within 3 weeks of claim acceptance. We usually do not indicate times for specific processes or activities, but it is occasionally useful to provide elapsed times for groups of activities, especially when the project is focused on reducing the time the process takes.

So far we have always shown process diagrams whose swimlanes run horizontally across the page. Some analysts prefer to have the swimlanes run vertically. If you do this, then the customer lane should be the leftmost lane and noncompany functions should be shown on the right side of the page. In Figure 9.10 we show the same information we pictured in Figure 9.9, arranged with vertical swimlanes. Obviously, in this case time will accumulate from the top downward.

We have always found it much easier to picture the flow of activities and to fit the information into process diagrams with horizontal swimlanes, and we will use them

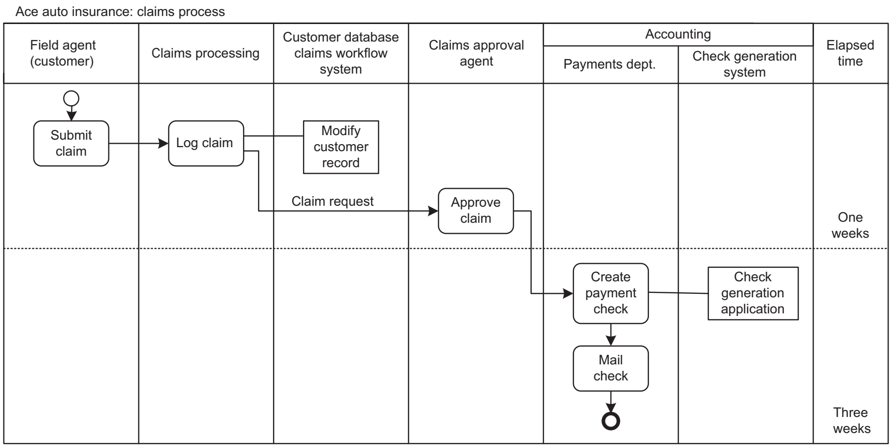


FIGURE 9.10

Auto insurance claims process with vertical swimlanes.

throughout this book. But, ultimately, this is just a matter of personal preference, and readers can just as well draw process diagrams with vertical swimlanes if that orientation works better for them.

As-Is, Could-Be, and To-Be Process Diagrams

In analyzing a specific business process we usually begin with an analysis of what is currently being done. We usually refer to the process diagram that documents the existing process as the As-Is process diagram. Once we understand what is currently being done we often generate alternative workflows and compare them. When we are creating speculative alternative diagrams we usually call them *Could-Be* process diagrams. When we finally arrive at the new process we term that a *To-Be* process diagram.

Figure 9.11 provides an example of a typical As-Is process diagram. In this case we actually are showing three layers of process. The entire diagram represents the *product launch* process. The three labels across the top—the R&D process, the *sales and marketing* process, and the *manufacturing and order fulfillment* process—define Level 2 decomposition. We've also inserted bold event circles to show where each secondary process ends. The process rectangles shown in the swimlanes represent a third level of decomposition.

In addition, we have introduced something else that is new in Figure 9.11: a customer swimlane with customer processes. Notice that the customer processes shown in the customer swimlane are connected and begin with a trigger event and end with an end-of-process event. In most diagrams we simply represent customer activities and do not link them together, simply because we are normally focused on the company's process. In some cases, however, it is useful to think about what a customer goes through to interact with your company. In effect, you create a customer process and then ask how you could improve it. If you can improve it, in essence, you are creating a better experience for your customer. Keep in mind when you study the customer process that the customer does not care about any processes that he or she does not interact with. The customer only cares about the steps he or she has to go through to accomplish the goals of his or her process. Imagine that you bought a laptop and now find that you need to replace a battery. You do not care what is going on inside the vendor's company—you only focus on the specific activities you have to go through to get the battery replaced. If your company makes it a lot harder and more complex to buy a product than your competitors don't be surprised to find that you are losing customers.

In the mid-1990s IBM promoted a business process method called LOVEM that used diagrams much like the ones used in this book. The "line of vision" referred to in the IBM method was the line between the organization and the customer, which we have highlighted in gray. Swimlane diagrams with the customer swimlane at the top provide everyone with a quick way of checking how and when your organization is interacting with its customers.

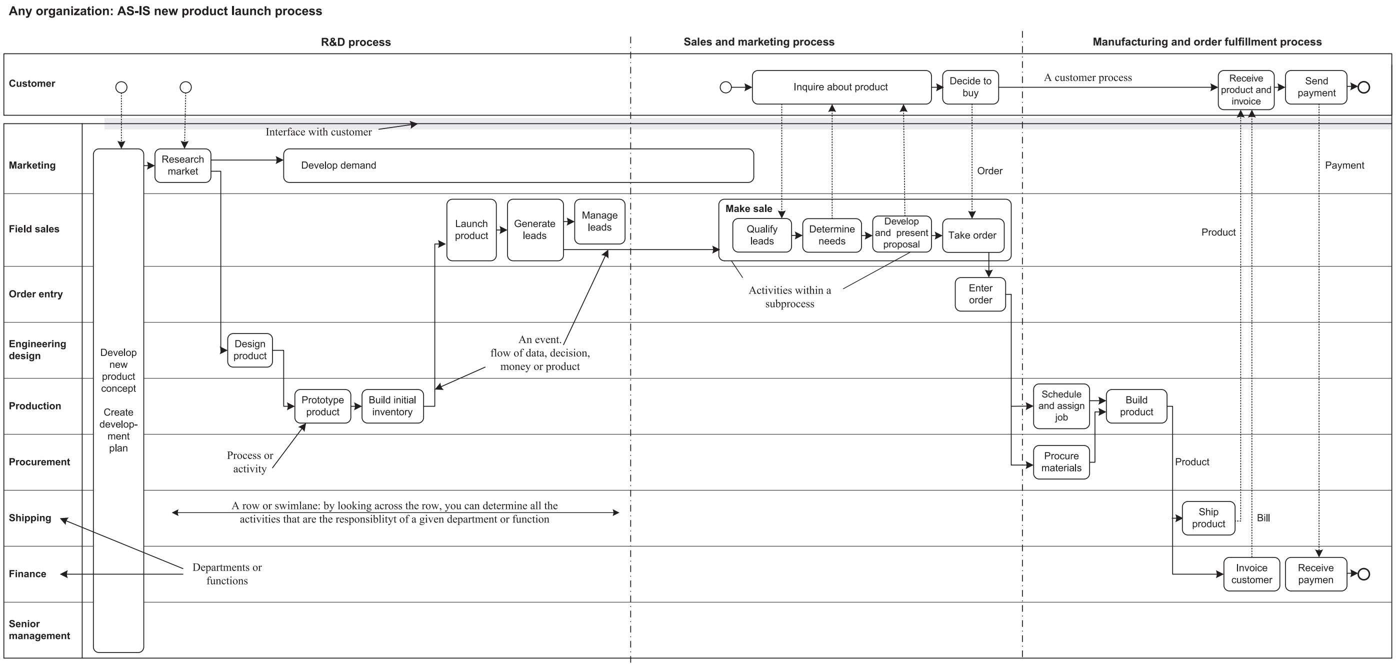


FIGURE 9.11

As-Is diagram of a *new product launch* process.

Figure 9.12 illustrates a To-Be diagram. It suggests how a team has decided to improve the *new product launch* process. In essence, the team decided to create a website and let the customers interact with the company via the Web. Thus when the customer interacts with the company now, he or she is interacting with a software application and information is going directly into the customer database. The customer can now access online, in the course of a single sitting, a variety of information that would otherwise have required separate inquiries. Similarly, if the customer decides to purchase the product the company now asks the customer to provide his or her credit card information, thereby arranging payment before the product is shipped. Notice how much these changes in the company's processes have simplified the customer's process.

A quick glance back at Figure 9.11 will indicate that we have removed sales activities and an order entry activity. When software is introduced into business processes lots of specific activities that were formerly done by individuals at specific points in time are done on a continuous basis by the software system. It usually is not worth maintaining the information on the process diagram. What is important is that you show when information is put into the software process and when information is given to workers by the software application. If you need to track what goes on within the software process box, it is usually best to prepare a separate process diagram that just shows what happens within the software process. And since that gets technical and depends on the company's hardware and software architecture it is usually best to leave that diagramming effort to software specialists.

In other words, in most cases you should focus on inputs and outputs to software processes and ignore the internal workings. If you want to ensure that everyone knows that the customer database is expected to maintain all information on customer contacts and orders you can write that and other system requirements on a separate note and attach it to the diagram.

We have represented some processes with long rectangles to suggest that they run while other processes are taking place. This occurs because, in effect, a workflow application or a database runs constantly, taking outputs from the processes shown on the diagram and using them to update the database, from which it subsequently withdraws the data to pass to subsequent activities.

If we were really going to try to automate the *new product launch* process there are many additional things we could do. We could add a production system, for example, to automatically handle scheduling and job assignments. We might also outsource the shipping operation, for example. An accounting system could automatically prepare bills. In addition, there are many activities we did not show. For example, we would probably add a third major software system to automate and control most of the accounting. New orders could be checked against the customer database as soon as they were entered, and credit checks could be handled before the order was ever transmitted to finance. An accounting system could automatically prepare invoices when it was notified that the order was shipped. Better, because it is an online system we could ask the customer to pay in advance, or provide information on an account that could be automatically debited when the product was shipped. In this

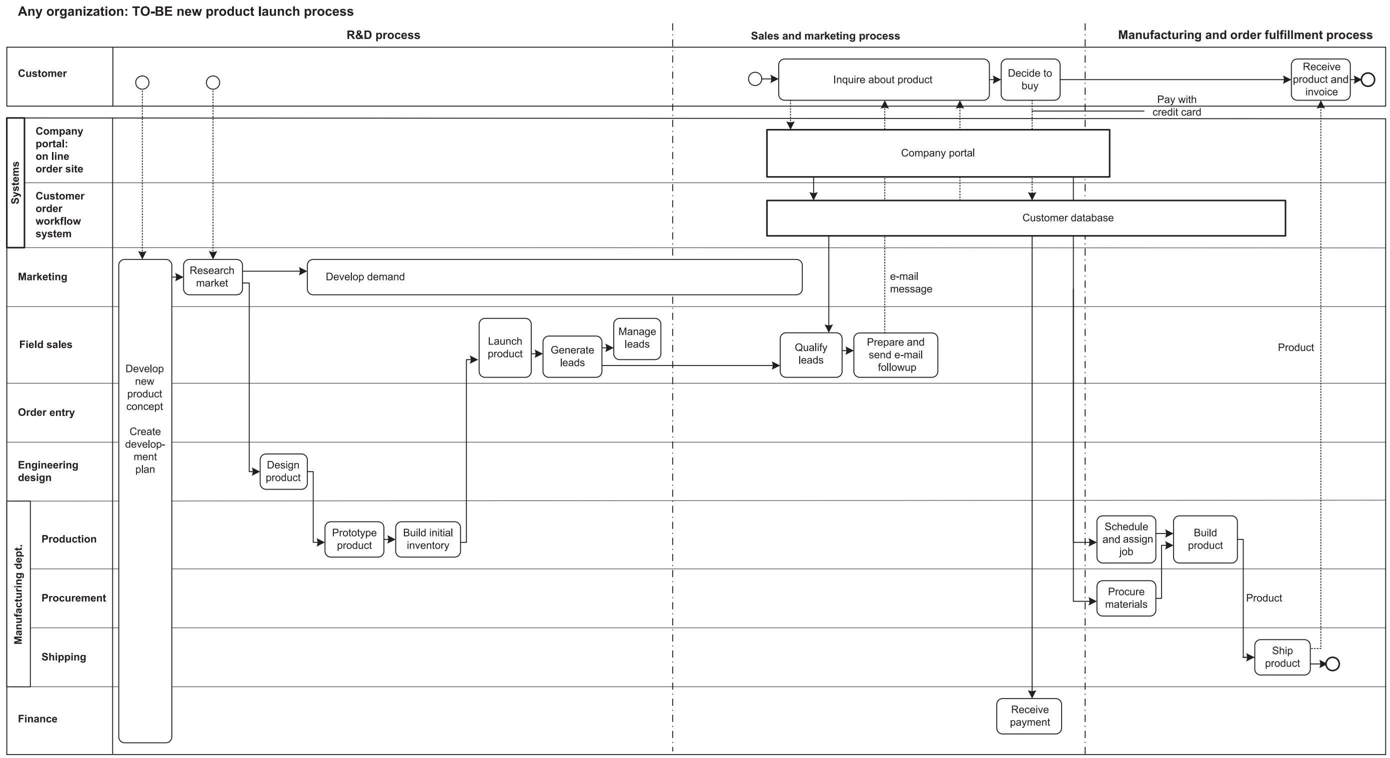


FIGURE 9.12

To-Be process diagram of the *new product launch* process.

case the customer database system would probably automatically contact an external financial institution to check the source of funds or the credit line to be debited later. In other words, we could automate this process a bit more. For our purposes here, however, it is enough that we have introduced the basic concepts and notation we will use when we discuss organizations, functions, and processes later in this book.

Case Management

We spoke earlier of the growing interest in modeling complex, dynamic processes. Keep in mind that just a few companies are doing this kind of modeling. Indeed, in the 2017 BPTrends Business Process Management survey we asked how many companies were currently engaged in analyzing and developing this type of process, and only a few said they were. Nevertheless, more will be doing so in the future, and vendors are already working on software features that will make the analysis, modeling, and development of a dynamic process a bit easier. So now is the time to begin to think about the nature of these processes and whether your organization ought to consider investing in dynamic technology when it becomes available.

The term *case management*, which is probably the most popular term for dynamic processes, comes from medical practice, so let us use a medical example. A patient calls at an emergency reception area, or drops in at his or her physician's office, with a problem. The patient becomes a "case." If you imagine that there was an established process—*diagnose and treat patients*—then, in essence, the hospital creates an instance (or case) of that process for the individual patient.

It is easy to imagine the high-level process, which we have pictured in Figure 9.13, using BPMN.

Obviously, we could refine the model shown in Figure 9.13. We could show a swimlane for the patient, and perhaps another for the laboratory when tests required specialists, or we could add adornments to indicate that each of the subprocesses shown in Figure 9.12 was undertaken by a person (a manual process), rather than being automated. Overall, however, for a variety of purposes Figure 9.13 would give us a good overview of the process.

It is hard to imagine that anyone would think the process shown in Figure 9.13 is rigid or lockstep, despite it being rendered in BPMN notation. It is at such a high level of abstraction, and each subprocess could cover such a wide range of activities, ranging from those appropriate for treating a heart attack to those used to deal with a

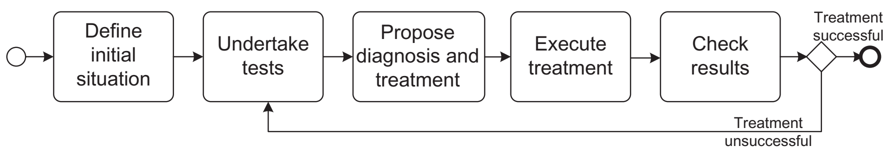


FIGURE 9.13

Diagnose and treat patients.

broken arm to still others for treating the flu. If anything, surely the major complaint would simply be that it is vague. The process describes a generic approach to treating all medical problems.

So let's think about how we might refine the process in Figure 9.13. One way might be to introduce a branching point between subprocesses 1 and 2. Something similar to what we show in Figure 9.14.

Everyone can see what is wrong with the solution in Figure 9.14. We do not begin to identify the thousands of problems that an emergency care facility or a physician might confront when a patient comes in for help. We could obviously create a hierarchy of problems, and do the diagnosis in a long series of binary decisions, as a botanist does when he or she tries to identify a plant. Still, it would be very complex.

Figure 9.15 represents a more elegant solution, but hardly improves on Figure 9.14. In essence, in Figure 9.15 we indicate that we will use business rules to make the decision during the *define initial situation* subprocess. As shown, however, this is almost as vague as Figure 9.13. It would only become more concrete if we showed the thousands of knowledge rules that we would need to actually make the diagnosis. Still, it could be done and it does represent a kind of solution.

Unfortunately, even if we could handle the decision in the *define initial situation* subprocess, we would face another task, even more daunting, when we tried to describe all the tests we would undertake, depending on the possible problems we identified in *define initial situation*.

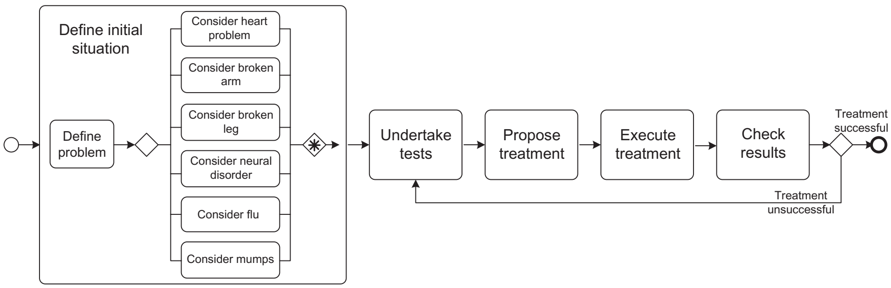


FIGURE 9.14

Diagnose and treat patients with some options shown.

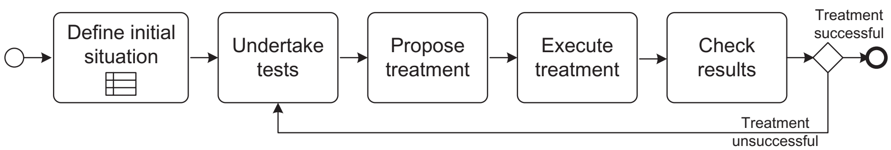


FIGURE 9.15

Diagnose and treat patients with an indication that a decision (e.g., business rules) will be made in the *undertake tests* subprocess.

This is similar to the situation faced by analysts in the 1980s when they began to try to develop systems that could handle problems that human experts handled. They found that branching models with activities and flow arrows were inadequate. The number of branches required were simply overwhelming.

A few years ago the OMG created a task force to see what could be done to establish some standards in the case management area. The companies represented on the task force include several major Business Process Management Software vendors. In 2013 the task force released *Case Management Model and Notation* (CMMN).

The task force has suggested that the existing BPMN (2.0) is appropriate for defining lockstep processes and contrasted it with their CMMN approach that is appropriate for dynamic, complex processes, which they prefer to term *cases*. A case is represented by a file folder, with the name of a type of case on it. This makes a case diagnosis much more specific than the example we looked at in Figures 9.13–9.15. The OMG team assumes someone walks into a physician's office and announces that he or she has a broken arm, and the physician needs to analyze that problem. Next, the OMG team assumes that a case involves several tasks, which are represented by rectangles with rounded corners (the same graphic that BPMN uses to represent a process or activity). And, although we will not go into so much detail in this chapter, the team assumes that one type of task could be a process.

Tasks are not connected by flow arrows. It is assumed that a given case includes many tasks, only a small subset of which might be used to deal with a specific instance of a case. (Imagine that the first subprocess in Figure 9.16 was a *case*, and

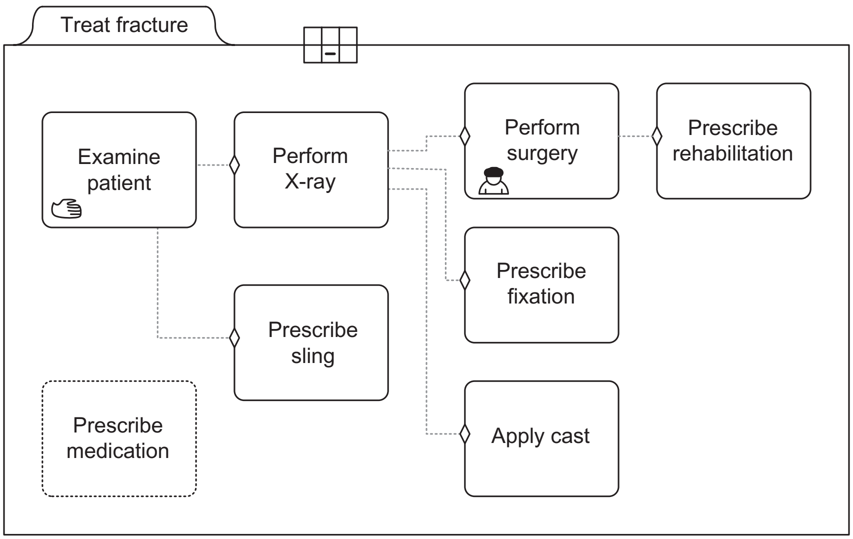


FIGURE 9.16

Case plan model for treat fracture with several tasks and an option planning table.

each of the alternative possible problems was a *task*.) Some tasks do depend on others, and a light dotted line is used to link tasks. When you see the notation you are to assume that the left or upper of the two boxes must be done before the right or lower box. (No arrowheads are used to show which is prior or subsequent.)

Some rectangles are bordered with a solid line, and some are bordered with a dotted line. Those with a dotted line are discretionary and can be invoked at any time.

In addition, a diamond placed on the border of a box indicates that the task can be "triggered" by some set of circumstances. If you imagine this as being done by rules, then the diamond, which is termed an *entry criterion*, describes the situation that would trigger the task.

Figure 9.15 pictures what is currently termed a *case plan model*. Specifically, it is a *case plan model for treat fracture*. We assume someone has arrived at a hospital with a fracture and the diagram below describes what the hospital might do. The small adornment on the top of the folder line with a grid and a minus sign is termed a planning table. The negative indicates that it is optional, but assuming it is used it defines possible relationships among the tasks. In this case a patient could begin either at the *examine patient* task or at the *prescribe medication* task. Assume he or she began at the *examine patient* task. Depending on the diagnosis (resulting decision) the patient could be given a sling, asked to get an X-ray, or discharged.

There are two symbols for manual in CMMN. The *hand* is referred to as "non-blocking" and means that another task could take place simultaneously—the physician could examine and pause to administer a pain-killing drug. The little person's head and shoulders is a blocking manual task. When that task is underway no other tasks can be applied to that patient. There are many other adornments, and we only mention a few. Obviously, readers interested in the detailed notation will have to be members of the OMG to get the complete Beta at this time, but we are only interested at giving a flavor at this point.

Let's step back and see where the CMMN notation is at this point. Clearly, the CMMN team assumes that some tasks will be automated, but that many will be performed by human performers.

Rules (or decision management if you prefer) will be heavily relied on to define moves among tasks—in most cases to document the logic, but probably not to automate the process. This leaves the information and in most cases the semantic networks that underlie the use of the rules. So far the CMMN team seems to be trying to ignore this. We do not think that will prove successful. We suspect that, as they evolve this notation, members of the OMG task force will find that they want to treat most tasks as a semantic net that captures knowledge about the task (or they may keep the tasks as a nod to the procedural flow and associate a semantic net to each task). (There is already an icon for a *CaseFileItem—a page with the top right corner turned down*—which could serve this purpose if it was developed.) Developers are going to have to specify the semantic networks anyway to formally define all the objects and attributes to be used in the knowledge rules, and we suspect in the long run it will be worthwhile including it in the notation and storing it in whatever software product is developed to support CMMN.

As we suggested, to date few companies are using CMMN and it's possible the notation will never be widely adopted. We personally prefer using an extension of BPMN, and simply including CMMN-type tasks with BPMN diagrams. We created Figures 9.12 and 9.14 to highlight that overview of the process could be developed using BPMN notation. We would rather include tasks within BPMN processes because we would prefer to go from a high-level abstract overview to specific subprocesses following a single, consistent notation. In any case, whatever notation is adopted, readers will see more articles on the analysis of complex processes in the years ahead.

Notes and References

This chapter relies on a loose interpretation of BPMN. We have used the notation, but added extensions occasionally to clarify things. We have included a formal description of the core BPMN notation as Appendix 1.

The official source of the BPMN specification is the OMG. You can go to their website and download the complete specification. Similarly, you can obtain the UML activity diagram notation at the OMG site as well.

By far the best introduction to BPMN is provided by two articles written by Stephen White, which can be found at the BPTrends website. White was the chair of the BPMN task force that created the notation. The articles are available at http://www.bptrends.com (search for Stephen White). In "Introduction to BPMN" (July 2004) White presents the basic BPMN notation. In "Process Modeling Notations and Workflow Patterns" (March, 2004) White shows how BPMN and UML could each model the workflow patterns that were described by Wil van der Aalst in *Workflow Management: Models, Methods, and Systems* (MIT Press, 2002). The patterns van der Aalst describes provide a good benchmark to the kinds of software situations that any comprehensive workflow tool should be able to model, and thus provide the process notation with a reasonable workout.

There has been a lot of discussion in the business and IT communities about the nature of business rules. Some business rules only specify policy actions. If X happens, then do Y. Other rules specify actions in more detail, so that the rules can be programmed into software. For our purposes, in this book we suggest that managers only focus on high-level rules that define policies and specify how decisions should be handled. Leave more precise rules for those that develop software. We'll consider the business rules literature in more detail in the notes after Chapter 10.

Throughout this chapter we have focused on the kind of simple BPMN diagrams that business managers or analysts might draw to help them examine and improve business processes. Thus we have primarily examined fairly large and complex processes. In some cases analysts might want to proceed to using the full set of BPMN notation so that they could specify a process so complete that it could be entirely automated. In this case they will likely be looking at what we would term a Level 4 or Level 5 process, something more narrowly prescribed than the processes we have looked at. There are two books we can highly recommend to provide help for readers who want to consider how to use BPMN in this more precise manner:

Silver, Bruce, *BPMN Method and Style*, Cody-Cassidy Press, 2009.

Dumas, Marlon, et al., *Fundamentals of Business Process Management*, Springer, 2013.

The existing CMMN notation is available from the OMG as a draft specification: *Case Management Model and Notation (CMMN)* (OMG Specification, FTF Beta 1, Document Number dtc/2013-01-01).

To examine an expert system with thousands of rules that solved medical diagnosis problems see:

Buchanan, Bruce G., and Edward H. Shortliffe, *Rule-Based Expert Systems: The Mycin Experiments of the Stanford Heuristic Programming Project*, Addison-Wesley, 1984.

CHAPTER

Modeling activities

10

In this chapter we will focus on activities and how you analyze them. The term *activity* in the latest version of Business Process Model and Notation (BPMN) (2.0) can have one of two meanings. In one sense it is simply a generic term for any subprocess. Thus it is always proper to say that a process is made up of a set of activities. In a narrower sense an *atomic activity* or *task* refers to the smallest processes we choose to model in any given analysis effort. Activity-level analysis is the most detailed analysis we undertake. (Recall Figure 8.3 for an overview of different levels of process analysis.) We said earlier that the work of a business is ultimately done by the processes that make up the business. In a similar way, the actual work done by any process is ultimately done by the tasks or atomic activities that make up the process.

In one sense an activity is just a process, and we show tasks or activities on process diagrams by using the same symbol (a rectangle with rounded corners). In another sense, however, when we try to say what occurs within an atomic activity we cross the line between describing process and entering into describing human behavior or the behavior of a software system. Our goal in this book, of course, is not to go deeply into the technologies used in the analysis of employee behavior or systems analysis. Business managers or business analysts who specify process changes are not normally expected to develop training materials or to program software. To complete a process description, however, they are expected to describe activities in enough detail so that others can write the job descriptions, create the training, or design the software needed to assure that the activity will be properly performed. Moreover, when managers actually manage processes during their execution they are expected to deal with human performance problems. Thus in this chapter and in subsequent chapters on automation we will describe techniques that business managers can use to assure that they understand and can communicate what must be done to perform a given activity.

Since an activity or task is of arbitrary size, any given activity could contain lots of different steps. In some cases hundreds of people might be employed in the accomplishment of a specific activity—say, picking grapes in a vineyard. Or an activity might be a meeting of a bank corporate loan committee in which several different people participate and discuss some complex decision.

If we are redesigning an important process we usually refine our models to the point where each activity represents a fairly discrete set of behaviors. In some cases we will want to run simulations. In those instances we will need to be very precise about what happens in each activity.

Business Process Change. https://doi.org/10.1016/B978-0-12-815847-0.00010-8

Analyzing a Specific Activity

Let's start with an activity that is performed by a single person. To simplify things further let's assume that the employee works full-time on the single activity. Imagine, for example, that the activity involves the entry of expense report information into a ledger. We hope no one does something like this without using a computer system today, but let's imagine that this activity is an entirely manual operation. In other words, there is a job description, describing the work of an expense report entry clerk, and there is a one-to-one relationship between the job description and the work done in the *enter expense reports* activity. We might diagram the activity as shown in Figure 10.1.

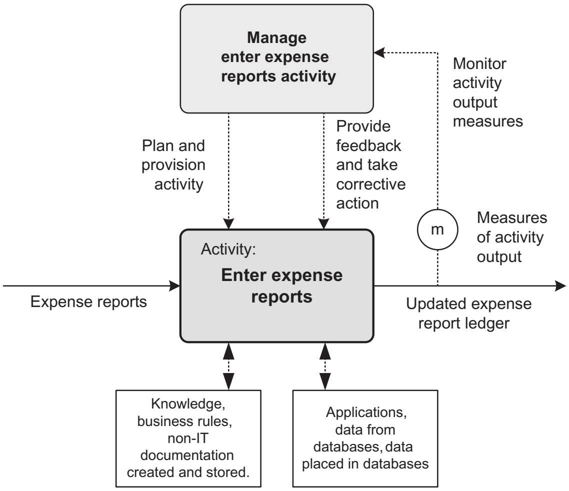
If we were going to analyze this activity we would begin by obtaining copies of *expense reports* and a correctly updated *expense report ledger*. Then we'd sit down with a skilled expense report entry clerk and watch the person do the job. We would take notes to describe the steps and actions taken by the clerk as he or she received the reports and then created the updated ledger. We assume the clerks would do things like stamp the incoming expense report with a date, and then examine it to see that it was complete. If it was complete the clerk would probably proceed to copy information from various locations on the expense report to other locations on the ledger. In some cases numbers would be added and sums would be entered. After the entry was complete the original report would probably be filed, and the ledger numbers added or subtracted to reflect a change in various balances. If the original report was incomplete we assume the clerk would follow some alternative path. For example, the report might be returned to the sender with a note pointing out that additional information was required.

In other words, the activity would be composed of a number of specific steps or tasks. The tasks would be triggered by the receipt of an expense report and terminate when the report was filed and the ledger was completely updated. Obviously, we could create a diagram showing each step and use arrows to show how the clerk moved from one step to the next, and where decisions and branches occurred. In this case, however, the analyst decided he or she didn't need a diagram and that a list of steps would suffice.

There would probably be some rules that helped the clerk make the needed decisions. One rule would state what constituted a complete report and specify that if reports were incomplete they should be returned to the submitter with a note about what was missing.

There might be other rules, specifying how to deal with reports submitted over a month late, or reports submitted with or without various types of documentation. Still other rules might deal with how to handle reports that deal with expenses in foreign currencies, or with reports in which the submitter included expenses that were not permitted by the company expense policy. There might also be rules requiring the signature of a senior manager.

In addition to defining the steps in the process and the rules to be followed at each step we might also document the time required to process an average expense report, the number of reports the clerk typically processed in a day, or the kinds of problems



Should be determined, regardless of implementation	• Define the goal of the activity. • Analysis of actual tasks or steps involved in the performance of the activity. • Determine if the activity adds or enables the addition of value. • Define appropriate measures of activity outcomes. • Define any decisions that must be taken in conjunction with the activity, and document appropriate business rules used to make decisions. • Define any data or knowledge that must be available for the performance of the activity. • Determine if activity should be done by an employee, a software component, or some combination.
Should be determined if activity is implemented by employees	• If it's to be done by an employee, do a human performance analysis that includes the management support system. • Determine specific ways to measure successful employee performance. • Use statistical measures to determine how consistently the activity is performed. • If appropriate do cognitive task analysis and determine performer's concept map and define the models and rules the performer uses to perform the task.
Should be determined if activity is implemented by software system	• If it's to be done by a software system, consider defining a use case or a class model. • Determine specific ways to measure successful application performance. • If it's to be done by a combination, define the interfaces between the performer and the system.
Should be done after the activity is implemented	• Define the cost and time consumed in the performance of the activity and the resources used and consumed. • Simulate the process and determine if the activity will perform adequately.

FIGURE 10.1

Simple activity and its associated management process.

or exceptions that were typically encountered and the frequency of each. We would probably also determine the salary of the clerk so that we could determine the cost of processing an average report, or of handling common exceptions. We might even check on departmental overhead estimates for office space, file space, and such to obtain an even more accurate idea of the total cost of the activity. Detailed procedures for accounting for specific activities is often termed activity-based costing (ABC) and this approach is sometimes used by companies that are very process focused.

We would also probably make some statement about the goal fulfilled by the activity—what value it adds to the production of company products or services. We might go on to gather data on how ledgers were evaluated by the activity supervisor, and document the rate and kinds of errors that occurred. Assuming multiple entry clerks were employed we would develop a statement about the quality and quantity of an average clerk, and about the output typical of the best and worst performers. In other words, we would want to know how consistently the task was performed and what kind of deviation there was.

If the employee or supervisor felt that there were problems with the performance of the activity we would ask the employee and the supervisor to suggest causes of the problems and gather any data we could to support or refute those suggestions.

In this example we are looking at a very straightforward job. In most companies jobs like these are so straightforward that they have been automated. If they haven't been automated, then they are clearly so elementary that they have probably long been documented manually, and new supervisors probably simply inherited the job description and various activity measures when they were made supervisor. On the other hand, there are a lot of more complex jobs that a manager might be made responsible for supervising. The manager of sales must do something similar for his or her salespeople, and the manager of software development must analyze the jobs and performance of programmers. We are now discussing more complex activities, but the basic principles are the same.

In this book, to provide readers with a quick way of organizing information they might want to gather about an activity, we will use two activity worksheets: a basic activity analysis worksheet and a supplemental activity cost worksheet. If you were using a software tool you would probably simply click on the activity rectangle on a process diagram and be able to enter this information. We've simply used worksheets as a quick way to summarize the kind of information you would want to record.

Figure 10.2 illustrates an activity worksheet we prepared for the *enter expense reports* activity. In this case we listed the basic steps, identified who was responsible for each step, and defined some of the decision rules that control the activity.

We didn't assume the use of computers in the activity described on the activity worksheet in Figure 10.2. If we had assumed a computer was used one of the key variables would be the computer screens that the performer used to enter or obtain information from the computer. In that case we would have noted the name or some other reference code to identify the computer screen used in each step. Often, if there are problems they arise because the user doesn't understand the information as presented on the computer screen or doesn't understand the appropriate response called for by the computer screen. For example, changes in the layout or text on the computer screen may solve the problem or improve performance.

If we were interested in doing cost analysis or simulation we would also need to gather additional information on the activity. We've provided a separate activity cost worksheet for such information, and it's pictured in Figure 10.3. As in all cases when worksheets are provided, if you were using a process modeling tool with a repository

Specific activity analysis worksheet

Activity : Enter expense reports   Process : XYZ Sales process

Activity performed by (✓) employee, ( ) software, ( ) a combination   Major output of activity : Updated expense report leger

Measures of output :
Ledger reflects all reported expenses documented in expense reports filed by sales personnel.
Ledger closed at the end of each month.

Steps in the activity	Responsibility	Decisions/Rules	Opportunities for improvement
1. Date-stamp each expense report when its recieved. 2. Review expense reports for completeness and accuracy (Return if incomplete.) 3. Cross check information on expense report with supporting documentation. 4. Enter information on expense report into ledger. 5. Update ledger 6. File expense report and supporting documentation.	Expense report entry Clerk responsible f or work. Work managed by sales accounting supervisor	Rule 1. No expense report is processed before supporting documentation arrives. Rule 2. Incomplete reports are rerouted to submitter for completion. Rule 3. Submitter is notified whenever an item is disallowed. Rule 4. Any sign of a purposeful attempt at fraud should be brought to attention of accounting supervisor. Rule 5. Expense reports must be processed and paid in month submitted Rule 6. If expense reports are submitted that are over 3 months old, the sales accounting supervisor should be nofified to approve processing.	

FIGURE 10.2

Activity worksheet.

Activity cost worksheet

Process or subprocess: XYZ Sales process   IS (✓) or SHOULD( ) Analysis

Activity	Outputs of activity	Time/output	Costs/output	Problems or decisions
Enter expense reports	Updated expense report ledger	15 min/report and update or 4/h	@$24/h (loaded with overhead) the cost per report is $6/	1 in 20 involves an exception which takes up to 30 min to process.

FIGURE 10.3

Activity cost worksheet.

you would record this kind of information direct into the repository so that it would become part of a permanent record of the activity.

In Figure 10.3 we've shown the data we gathered on the *enter expense reports* activity. We marked it "IS" to indicate that this is the way the activity was performed in the existing As-Is process.

Assuming that the *enter expense reports* activity was performed by an individual, part of the analysis effort might involve defining or redefining the job of the individual that performed the activity. In most cases this will be beyond the basic scope of the process analysis effort. Typically, the process analysis team would simply define the activity and leave specialists from HR to refine the job description of the individual who performs the job. In some cases, however, if there are problems with this specific activity process analysts need a general approach to analyzing the performance of manual activities.

Analyzing Human Performance

When an activity is not being performed correctly we need to analyze the situation to see what could be wrong. The best approach to this is *human performance analysis*, a technology developed by psychologists and performance analysts over the course of the last 50 years. Human performance analysis defines the variables that affect human performance and offers heuristics for analyzing any given human activity. Figure 10.4 provides a version of the human performance model used by Rummler in *Improving Performance*.

Let's consider each of the factors illustrated in Figure 10.4 in more detail.

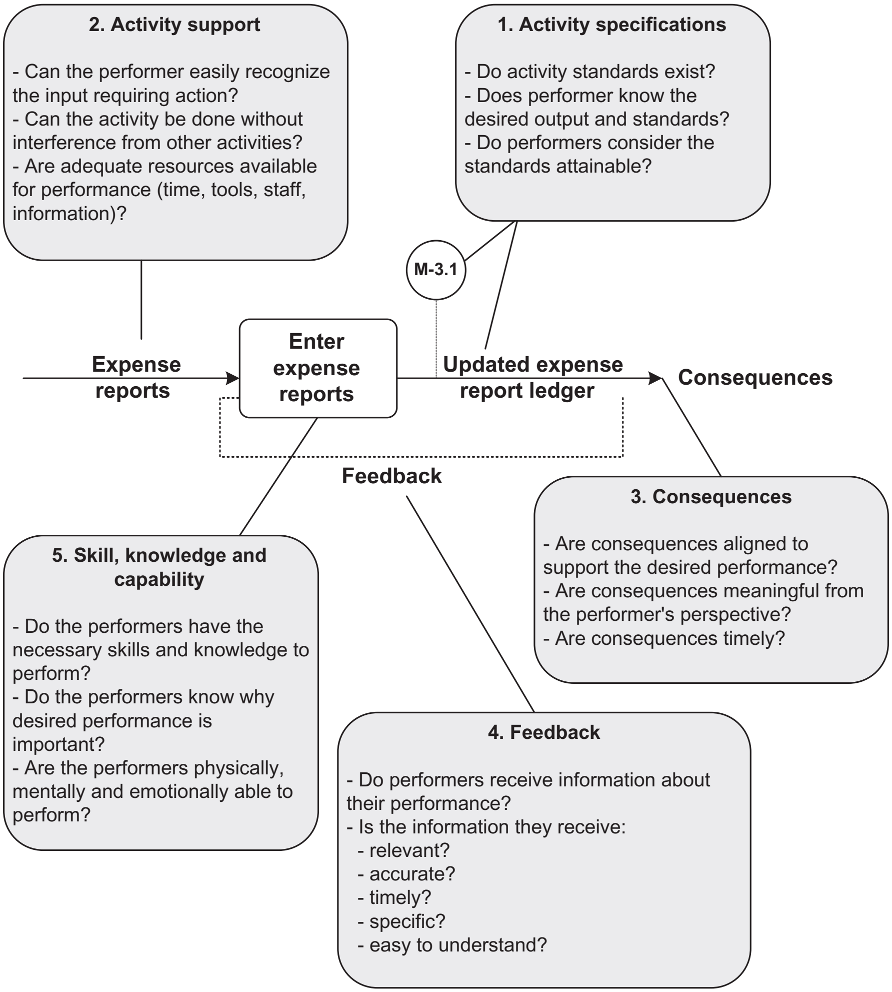


FIGURE 10.4

Factors affecting the performance of an activity.

Modified from Rummler and Brache, Improving Performance.

Activity Standards

Do activity standards exist? If measures exist, then one assumes they measure whether the activity meets one or more standards. Obviously, if you are a new manager and there are no existing measures or standards in place, then your first job is to create them. It's always useful to check to see if standards are documented and to ask performers how they interpret the standards. It's always possible that someone provided performers with standards, then established measures. Later they might have changed measures without realigning the standards that the employees are using. Similarly, it's worth checking what standards software developers used when they created any software component used in the activity, and assure they are current and aligned.

Does the performer know the desired output and standards? Once the manager knows that standards exist he or she should next determine that the people or systems performing the activity know what the standards are. Obviously, people can't systematically achieve a standard they don't know about. If performers don't know about a standard it's the manager's job not only to assure that they learn about the standard, but also to devise an arrangement to make sure that they don't forget it, and that other, new performers learn of the standard. Moving the standard from a line of text in a manual to a sign posted in the workplace is one way to accomplish this.

Do performers consider the standards attainable? Few people persist in trying to achieve what they think of as an impossible goal. When systems designers are asked to create components that are expected to achieve results the designers know they can't achieve they tend to create components that simply do what can be done. Unattainable standards shouldn't happen, but occasionally they are established by someone who isn't being realistic. A manager needs to check to see that everyone agrees that the standards are indeed attainable. If they aren't, either because no one could achieve that standard or because an existing performer can't, the manager needs to make changes. In the first case one changes the standard. In the second one changes the performer or system.

Activity Support

Can the performer easily recognize the input requiring action? Consider a situation in which salespeople are wasting their time on unqualified prospects. The manager should begin by determining if the salespeople know what a "qualified prospect" is. If the salespeople don't know the difference, then one step in solving the problem is to teach them how to recognize qualified and unqualified prospects. There are lots of problems that arise from similar causes. Diagnosticians don't check for certain potential problems because they don't recognize the signs that suggest they should make such a check. Developers create systems that respond to one set of inputs, but don't build components that respond to other inputs because they don't realize that those situations could occur.

Can the activity be done without interference from other activities? Sometimes one activity will interfere with another. Consider, for example, a salesperson under pressure to obtain more sales and to provide documentation for past sales. These are two separate activities, and in a good situation there would be time for both.

Sometimes, however, achieving one activity might preclude the successful completion of another. Or, consider that one person may need to answer phones right next to someone who is trying to write a report. The report writer is constantly distracted by the person carrying on phone conversations. Or, consider that a given activity may require a forklift, which someone else is always using for some other activity. In an ideal workplace none of these things would happen, but in the real world they often do. Managers need to check the environment in which the work is to take place to assure themselves that one activity isn't interfering with the performance of another.

Are adequate resources available for performance (time, tools, staff, information)? Are needed resources available to those performing the activity? Do they have the time required? Do they have the tools needed for the job? If staff support is required is it available and adequate for the job? If information is needed is it available? These are obvious sorts of things, but more performance failures can be tracked to environmental problems than to a lack of trained employees or employees who willfully choose not to perform some task. This is an extension of budgeting—assuring that employees and systems have the resources needed to perform their jobs.

Consequences

Are consequences aligned to support the desired performance? Motivation can be turned into a complex subject. In most cases it's really quite simple. It involves knowledge of the task to be performed, consequences, and feedback. Consequences refer to whatever follows the performance of an activity. Salespeople who make sales usually expect praise and bonuses. Every sales manager knows that a good incentive system gets good results. If people perform and only get complaints that they didn't do even better in most cases it results in even less adequate performance. Imagine two activities: sales and entering information about sales. Imagine that the salesperson has less time than is needed to perform both tasks well. Furthermore, imagine that he or she gets a significant bonus for every sale, but only gets complaints at the end of the month if all the system entries haven't been made. Which is the salesperson likely to do? It's always important to not only consider the consequences of each task by itself, but to also consider the effect of asking one individual to do several tasks with different consequences.

Are consequences meaningful from the performer's perspective? Different individuals respond differently to different types of consequences. It's important that the consequences be appropriate to the individual. Bonuses usually work, but in many situations a day off will be more appreciated than a small bonus. Similarly, some employees might look forward to an opportunity to do some business travel while others might regard being asked to travel as a kind of punishment. The good manager should have a clear idea of what types of rewards will be values by each different employee.

Are consequences timely? Lots of research shows that consequences that immediately follow an activity are more likely to affect performance than those that are delayed. This doesn't mean that you need to hand salespeople money as soon as they return from a successful sales call. It does mean that the reward system should be clear so that the salesperson can calculate what bonus he or she made on that sales call. Making an effort without knowing if there will be consequences isn't a good practice. Giving someone a big, surprise bonus at the end of the year isn't nearly as good as giving smaller bonuses that are clearly associated with excellent performance. The best system is one that makes the consequences clear so that employees can mentally reward themselves when they succeed. The same thing is true in reverse. Punishment should be closely associated with the action that deserves punishment. Waiting for a yearly evaluation to tell someone he or she is not performing up to snuff is a bad policy.

Feedback

Do performers receive information about their performance? Forgetting more explicit rewards every manager should ask if employees receive information about the outcomes of their work. Assume the manager collects information about the number of chairs that arrive at the distributor's site undamaged versus those with defects. As soon as the manager gets such information he or she should pass it along to the employees involved. If defects go down employees should learn about it (and receive praise as a consequence). If defects go up employees should be informed immediately. Similarly, if chairs arrived damaged as a result of poor packaging the employees in shipping should learn about it immediately, and vice versa. In too many companies employees carry on doing their jobs for months before someone tells them if their work is adequate or not. After a while most employees will take a little less care if as far as they can tell no one notices or remarks about their work. This is an area where the process sponsor plays an important role. Often the feedback needed by people in one subprocess isn't immediately available to the functional manager responsible for that subprocess. Care taken in packing may only pay off in reduced customer complaints, which go to sales and service and never directly to manufacturing or packaging. It's the process sponsor's job to design a process-wide feedback system that assures that subprocess managers have the information they need to provide their people with timely feedback.

Is the information they receive relevant, accurate, timely, specific, and easy to understand? As with consequences there is more useful and less useful feedback. It's important to tell the packaging people that chairs are getting damaged in transit because chairs aren't properly packed. It's much more useful to tell them exactly how the chairs are being damaged so they will know how to change their packaging process to avoid the problem. Many companies provide managers with accounting data that are summarized in ways only accountants can understand. This isn't useful feedback. (This is one of the reasons for moving to an ABC system to assure that cost information can tell specific employees about whether specific activities and subprocesses are contributing to the value of products or costing the company money.) A manager who yells that a subprocess isn't performing up to snuff without being specific about what's wrong is only creating anxiety and increasing the problems facing the people in that subprocess.

Skill, Knowledge, and Capability

Do the performers have the necessary skills and knowledge to perform? In many companies the solution to all performance problems is to provide more training. For many employees one of the worst features of a job is having to sit through training courses that drone on about things one already knows. The performance of a task requires specific information and the skills needed to evaluate the information, make decisions, and perform tasks. In most cases the place to begin is to identify the performer who is doing the job right, and then ask what is missing in the case of a performer who isn't doing the job right. If the deficient performer needs to learn specific items of knowledge or specific skills, then some kind of training is appropriate. Before training, however, be sure you really are facing a skill or knowledge problem. If employees have performed correctly in the past it's very unlikely they have forgotten what they knew. It's much more likely in such a case that you have an environmental problem or a problem arising from a lack of feedback or consequences.

Do the performers know why desired performance is important? The importance and effort we assign to a task usually reflects our understanding of the importance of the consequences that result. If employees don't realize that some seemingly minor shutdown procedure, if left undone, can infrequently cause a major explosion they might tend to skip the shutdown procedure. On most days, indeed for months or years, there may be no consequence. In these situations it's important that employees have a good overview of what's important and why it's important.

Are the performers physically, mentally, and emotionally able to perform? Finally, it's important to assure that performers can actually perform the tasks assigned. If employees can't reach a shelf or can't read English there are tasks they simply can't perform. In some cases changes in the environment will help. Steps can be provided or signs can be posted in another language. In some cases, however, an individual simply isn't able to perform a task. In those cases another performer needs to be assigned to the task.

As we suggested earlier most of these same criteria apply to systems, although in the case of systems the understanding and the feedback usually involve the person maintaining the software system and not the software itself.

An interesting complement to the approach we have described here is provided by the People Capability Maturity Model (People-CMM). We discussed the CMM in the Introduction. It provides an analysis of the process orientation and maturity of organizations based on standards developed by Carnegie-Mellon University. When we spoke of it earlier we emphasized the transitions that organizations go through to become more systematic in their use of a process-oriented approach to management. Bill Curtis and others have created a variation on CMM that emphasizes how organizations support their workforce, and have shown cultural changes that occur in the way people are managed as organizations become more sophisticated in their use and management of processes. The People-CMM approach should be studied by any manager who wants a high-level overview of how effective organizations change their people management practices as they become more mature in their support of processes. We describe a good book on this approach in the Notes and References section at the end of the book.

Managing the Performance of Activities

Broadly, an operational manager is responsible for five things:

1. Identifying goals to be accomplished
2. Organizing activities to accomplish those goals
3. Communicating the goals to the employees
4. Monitoring the output of the activities to assure they meet their assigned goals
5. Diagnosing problems and fixing them when activity output is inadequate

In many if not most cases defective output is a result of a flaw in the design of the activity or an environmental problem that prevents correct execution of the activity. In rarer cases the correction of the defect requires a change in the software system or one or more people assigned to perform the task.

The key, as we have stressed elsewhere, is for operational managers to organize around subprocesses and activities. Managing employees separate from the activities they are expected to perform is always a bad practice. The good manager begins by understanding the process and improves it if he or she can. Only after the process is organized does the manager turn his or her attention to the performers, and then only in the context of successful or inadequate output measures. This approach can go a long way toward taking the blame out of management, and focusing everyone instead on the problems of performing activities in ways that achieve company goals.

Automating the Enter Expense Reports Activity

As we suggested earlier the entry of expense reports is so straightforward that it has probably been automated at most companies.

In some cases employees enter their travel expense information directly in software programs on their laptop computers and transmit it via the Internet to accounting. The expense reports generated in this way may be examined by a clerk or passed electronically to an application that analyzes them, makes calculations, and generates checks for the employees. In most cases, however, an employee examines the forms on a computer screen and approves the claims before they are paid. In any case paper documentation for the expenses still has to be mailed in and needs to be filed. Most large companies conduct internal audits to compare documentation with payments.

One way we might represent this situation is illustrated in Figure 10.5. In this case we show that the entry of expense reports by the salespeople is a mixed manual–systems task. (The salesperson is completing a form managed by a software application that he or she accesses via the Internet.) Later, before a payment can be made the report must be reviewed and approved by an expense report clerk. This is another mixed activity. The expense report clerk is also using a computer. The sales system sends the report to the clerk's computer and he or she approves it, after comparing it with the salesperson's documentation. After the clerk indicates that the report is approved the sales system automatically generates the payment to the salesperson

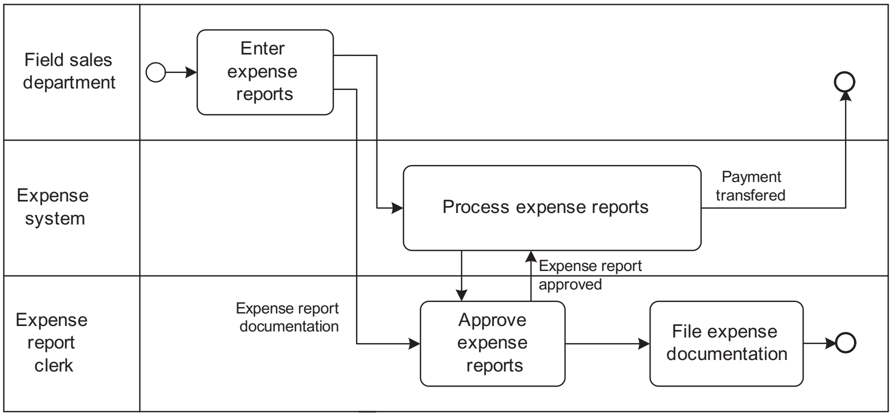


FIGURE 10.5

An automated expense report system.

and transfers the money to his or her bank account. Meanwhile, the expense report clerk files the documentation.

In Figure 10.4 we assumed that the *enter expense reports* activity was performed by a clerk. In Figure 10.5 we assume the entry activity is performed by a salesperson.

In Figure 10.5 the expense clerk has a new job. The forms now arrive by computer, and the clerk approves them online. The inputs would be computer screens rather than forms. The clerk would have to know how to use a computer, access the electronic forms, and approve them. The procedure would be different, and the clerk would need to learn the new sequence. In this case, as with most automated systems, one of the key problems would be consequences and feedback. It's easy to automate the system and forget that the performer may no longer be in a position to know about the consequences of his or her work. If we want the clerk to review and approve 50 reports a day we might want to provide a counter as part of the software application so the clerk knows how he or she is doing. We might also want to create a way for the clerk to learn when payments are made so he or she will be in a position to tell a salesperson who inquires about the status of a check when it will likely be paid.

In effect, each time an arrow goes from a manual activity to an automated activity there is a computer interface, made up of one or multiple computer screens that the user needs to master. The salesperson has a set of computer screens that allow him or her to create a new expense report and then fill in expense information. Similarly, the clerk interacts with the expense reports on screen. The clarity and logic of the screen layouts is a major factor in efficient processing.

We haven't shown what happens in the case of various exceptions as, for example, when the documentation is incomplete, or when the clerk needs to move an expense item from one category to another or to disallow it altogether. We might create an activity worksheet to document this information. If we were going to ask an IT group to create the *expense report* application they would need answers to these questions.

On the other hand, if we buy the *expense report* application from an outside vendor they should provide documentation, and the manager and employee will need to study the documentation and redesign their activity to accommodate the new software application.

More Complex Activity

We considered expense approval activity because it was simple and provided us with a good overview of what was involved in analyzing an activity. Now, let's consider a more complex activity, like selling. Assume that the same company that employs the expense report entry clerk also employs salespeople. These salespeople sell the company's products throughout North America by calling on customers, explaining the products, and taking orders. The salespeople are divided into regions managed by regional managers, and so forth. To keep things relatively simple, we are only going to focus on the sales job in its most generic form. In a process diagram it might simply look like Figure 10.6.

Once again, we could easily analyze sales activities in much greater detail. For our purposes, however, it might be easier in this case to provide a job description in a text format. Figure 10.7, for example, is an overview of the salesperson's job description.

We could go further and write more detailed descriptions of each of these activities and assign measures to each or at least to the more important activities. For example, we could specify how many sales are expected per unit of time, how many prospect calls need to be made each month, or when expense accounts need to be submitted.

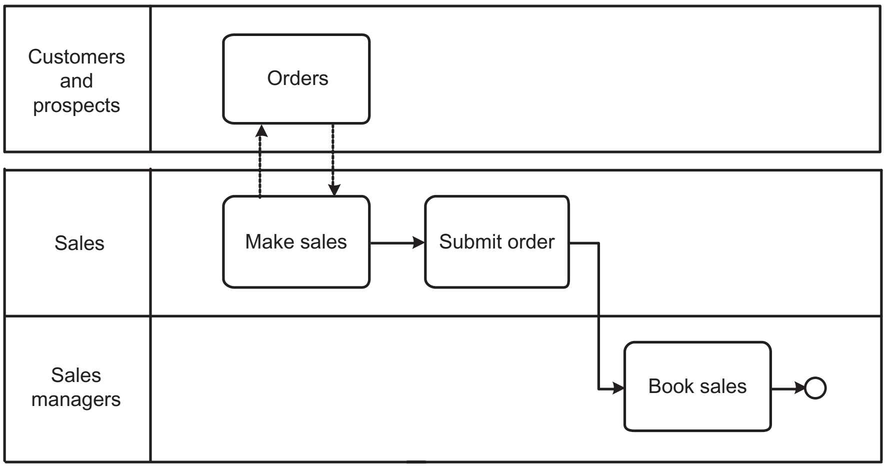


FIGURE 10.6

Sales activities.

Sales activities that define the salesperson's job

Selling activities
1. Customer-related activities
   1.1 Prepare account related paperwork
   1.2 Prepare cross selling proposals
   1.3 Make maintenance calls
   1.4 Maintain customer contact by phone or email
2. Prospect-related activities
   2.1 Identify new prospects
   2.2 Contact and qualify new prospects
   2.3 Make sales calls
   2.4 Develop proposals
   2.5 Maintain prospect contact by phone or email

Overhead activities
3. Planning and coordinating activities
   3.1 Time and territory planning
   3.2 Prioritizing accounts
   3.3 Key account strategizing
4. Organizational activities
   4.1 Meeting with manager
   4.2 Attending sales meetings
   4.3 Accounting for time and expenses
   4.4 Preparing special reports
5. Product knowledge
   5.1 Keeping current on new products
   5.2 Keeping current on competitive products
   5.3 Maintaining contacts with in-house specialists
6. Self-development and motivation
   6.1 Keeping current on general business trends
   6.2 Keeping current on general selling and marketing trends and practices
   6.3 Arranging a personal schedule of contingencies

FIGURE 10.7

Job description of a salesperson.

In effect, the job description in Figure 10.7 defines the salesperson's job. Assuming we only want to list two activities—*make sales* and *submit orders*—then this job description defines the steps that define those activities.

If you were the sales manager and you decided that sales were inadequate you would need to define the tasks as we have and measure results to obtain some idea about what could be wrong. Measures of actual sales performance might reveal that most salespeople were performing in an adequate manner, but that a few weren't. In that case the sales manager would need to focus on the salespeople who weren't performing adequately. If most salespeople were performing in about the same manner, however, then the manager would need to consider redesigning the sales job or activity to correct a more generic problem.

In either case the place to begin the analysis would be to analyze the sales tasks and compare them with the human performance model we presented in Figure 10.4.

To make this easier we use a human performance analysis worksheet, which is pictured in Figure 10.8.

We haven't filled in the complete worksheet, but we did enter a few questions to suggest how a sales manager might begin to analyze what could be wrong with a deficient sales activity.

To analyze the sales activity one begins by identifying the measures and examining historical records. The best performer should be compared with the average performer. That provides information on the gap between the best and the average, and provides a measurement of how much improvement could be obtained if everyone performing the activity performed as well as the best performer. Assuming the gap is worth the effort you then need to examine the performance variables, in each case comparing the best and the average salesperson, to identify just where the differences lie. (We'll speak more of this type of analysis in the next chapter when we consider measurement in more detail.) Once the problems are identified the supervisor can develop an improvement program.

Human performance analysis worksheet

Process or subprocess: XYZ sales process   Activity or job: XYZ sales activity   AS-IS (✓) or TO BE ( ) Analysis

Tasks included in activity	Measures of task performance	Potential performance problems				
		Activity specifications	Activity support	Consequences	Feedback	Skill, knowledge, and capability
1. Customer-related activities - Preparing account-related paperwork - Preparing cross-selling proposals - Making maintenance calls - Maintaining customer contact	Increase sales to existing customers by 12% per quarter	Does the sales-person know the goals? Does the salesperson consider the goals attainable?	Does sales-person's territory have enough prospects?	Does the current bonus system reflect the effort required?	Does the salesperson get email whenever the company gets a complaint, or a compliment from one of his/her customers?	Does the salesperson understand the new product line? Does the salesperson understand how to demonstrate the new product with his/her laptop?
2. Prospect-related activities - Identifying new prospects - Contacting and qualifying prospects - Making sales calls - Developing proposals - Maintaining prospect contact	Make 20 new sales per month.		Does the salesperson get leads whenever they come to company? Does the salesperson have the new laptops with the new demo loaded?			

FIGURE 10.8

Partially completed human performance analysis worksheet for sales activity.

Continued

Human performance analysis worksheet (continued)							
Process or subprocess: XYZ sales process		Activity or job: XYZ sales activity			AS-IS (✓) or TO BE ( ) Analysis		
Tasks included in activity	Measures of task performance	Potential performance problems					
		Activity standards	Activity support	Consequences	Feedback	Skill, knowledge, and capability	
3. Planning and coordinating activities - Time and territory planning - Prioritizing accounts - Key account strategizing							
4. Organizational activities - Meeting with manager - Attending sales meetings - Accounting for time and expenses - Preparing special reports							
5. Product knowledge - Keeping current on new products - Keeping current on competitive products - Maintaining contacts with in-house specialists							
6. Self-development and motivation - Keeping current on general business trends - Keeping current on general selling and marketing trends - Arranging a personal schedule of contingencies							

FIGURE 10.8, CONT'D

Empowering Employees

Much has been written about how different types of managers approach their relationships with the employees who work for them. Broadly, some managers prefer to give orders and then monitor compliance. Others prefer to give direction and depend on the ingenuity of the employees to achieve results. In essence, the latter type of manager functions as a leader and a mentor. Numerous studies have shown that the second approach works best when both manager and employees understand the approach. Mature process-focused organizations almost invariably depend on individual employees or teams of employees to work together to solve problems and accomplish tasks. Today's employees, especially in advanced economies, resent too much control and are motivated by being given more control over the work for which they are responsible. This is especially true when one is trying to manage knowledge workers who were hired initially in the hope that they would be flexible and creative. One only needs to visit an organization like Toyota, where employee teams work with managers to constantly improve business processes, to become a firm believer in having managers work as mentors to employee teams who take responsibility for achieving and improving on the goals they are given.

As organizations increasingly automate, the human workers who remain become more important as an interface to the organization's customers. Similarly, service organizations with many customer touch points are very dependent on employees to assure customer satisfaction. To be effective, employees need to have the flexibility and authority to make quick decisions to assure that customers are satisfied with the organization's service. Every reader has experienced the frustration of talking to one employee after another and being constantly sent to someone else. Faced with this we have all thought how much better it would have been if the organization had cross-trained its employees and empowered them to make decisions that would solve our problems.

Management practices depend on a given organization's culture, and it is very hard to institute employee teams in less mature organizations. Still, most process analysts ought to consider how work is organized as they study specific processes, and consider how much they could improve the work by shifting more decision power to the employees who are actually doing the work, especially if they interact with customers.

Analyzing a Completely Automated Activity

The expense clerk's job provided a nice example of a simple job that might involve a mix of manual and computer-aided performance. The sales job is a more complex job that also has computer-aided elements, but is primarily a job performed by a human employee. In addition, the job is complex enough to assure that the manual or procedural aspects of the job are trivial compared with the analysis, decision making, and human interaction skills required of the performer. The sales job is the kind of job that might require human performance analysts from HR to help define and to assist in any needed training.

A third possibility is that we define an activity that will be completely automated. During the initial analysis phase of most process redesign projects it doesn't make any difference whether the activity is performed by a person or a software system running on a computer. In both cases we need to determine the inputs and outputs of the activity and measures for judging the quality of the outputs. Similarly, we need to determine how the activity relates to other activities in the same process, and who will be responsible for managing the activity.

Once we decide the activity will be automated we usually turn the actual software development task over to an appropriate IT group within the organization. In some cases we will be asking that an existing application be modified. In other cases we will be asking for the creation of a new software system. In either case there usually isn't a one-to-one relationship between activities identified on our process diagrams and the software application to be developed. Recall Figure 10.5 where we indicated that a software application would capture expense reports from salespeople, place reports on the expense report clerk's computer, and later generate payments and transfer them to salespeople's bank accounts. In this case we were treating the software application as a black box. We really don't know or care if the application that automated the *sales expense report entry* activity is a single application or a combination of applications. That's a software design issue that IT will need to solve. It will depend on existing software applications being used, on the hardware used by various individuals, on the infrastructure already in place, and on the skills and software architectural strategies of the IT organization.

The important thing from our perspective is to define the inputs and outputs as well as the performance requirements of the activity as best we can, and then to turn the task over to IT. Figure 10.9 reproduces a variation of Figure 10.5. In this case we have added small boxes where the arrows from manual activities interface with a software system and labeled them I-1 and I-2, to indicate that there are two interfaces we will need to describe. Depending on the time available we could actually sketch the screens that we imagine would be used at each interface. Similarly, we could create lists of all the data that are to be captured by each screen. We probably wouldn't go so far as to try to organize or structure the data to be collected, since that is usually done by the individual in IT who creates the database to store expense information. We can however indicate the data we know we will want to collect. (In the Notes and References at the end of the chapter we suggest books on interface or web form design.)

Predictably, IT will need more information than we will probably provide. We probably won't consider all the exceptions, and an IT analyst will surely want to work with our design team to define more exact requirements. In essence, when we seek to fill the salesperson's job we hire for a lot of skills, knowledge, and experience. We only have to teach a new salesperson a portion of his or her job. Humans

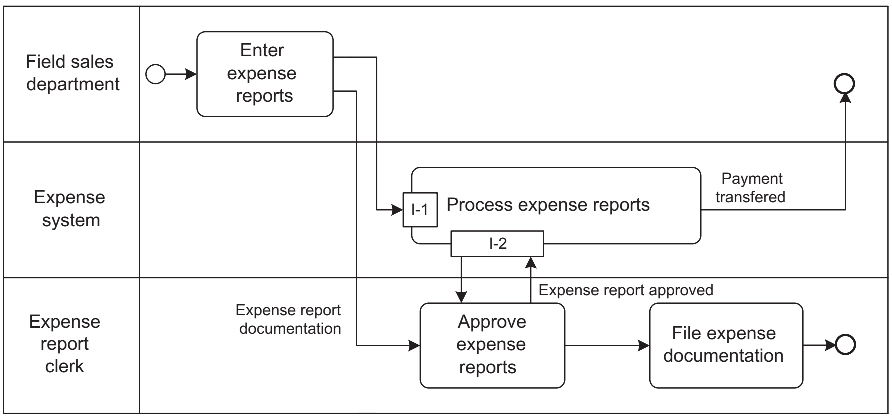


FIGURE 10.9

Expense system with software interfaces noted.

come equipped with lots of common sense and can generalize from common business practices, or ask when they run into problems. Software systems usually don't come with common sense or the ability to ask when they get in trouble. Hence, we need to be much more precise about defining activities that are to be performed by software systems and anticipate every possible problem that might occur. The key from the perspective of the process designer, however, is who should do what when. We believe that the process design team should define each activity as if it were being done by an intelligent person. Beyond that, when it turns out that the task is to be performed by a software system, IT analysts should be called in to work with the process design team to define the activity more precisely, and then be allowed to develop the software application in the way that works best. IT may decide that five different activities will be part of a single software application, or should be implemented via two separate software components. The process redesign team shouldn't worry about such details as long as IT develops a system that functions as specified on the process diagram. In other words, the IT application must take the specified inputs from the designated individuals and make the specified outputs in accordance with measures established by the process redesign team.

In a nutshell, we carefully define the inputs and outputs of activities that are to be performed by software applications, and leave the actual development of the software applications to the IT folks.

Decision Management

Some activities simply manipulate physical objects. Many activities, however, involve making decisions. A bank officer may decide to grant or deny an auto loan to an applicant, or a programmer may decide to use a specific programming language to write a specific application. In either case some employees may make excellent decisions and others may make less optimal decisions. Any organization would benefit if every decision made by every employee was an excellent decision. How can managers assure better decisions?

Decision management is an evolving field that tries to structure knowledge and use it to help employees make good decisions. A few years ago many of the activities that now go under the name *decision management*, would have been termed *business rules*. Several things have changed. First, the techniques involved in decision management are being integrated with business process analysis. Second, those working in decision management have found that it is often better to rely on decision tables or other graphical formats to communicate needed information. In addition, everyone has agreed that we need to provide more structure if we are to assure that decisions are well made.

In the 1980s many business analysts discovered the power of rules when they learned about AI and, specifically, expert systems. In essence, a software algorithm—an inference engine—could use logic to process a set of rules and arrive at a logical conclusion. The developer did not need to arrange the rules in any particular order:

He or she merely needs to state the rules correctly; the inference engine would then examine the rules and create its own logical sequence. Using this approach a system can easily analyze a problem that involves hundreds or thousands of rules and reach conclusions with an accuracy most humans would have trouble duplicating.

Those who followed the expert systems market in the 1980s observed the early rule-based tools evolved into hybrid expert system tools that combined objects and rules. The objects in effect created a structured network of concepts and grouped the rules into sets associated with specific facts and concepts to enable more efficient processing.

Many companies developed expert systems, and some are still in use. Most expert systems, however, have now disappeared. The problem with expert systems is that expert knowledge changes so quickly that, given current techniques, it costs more to maintain the expert system than it is worth. (In Chapter 18 we will see that AI decision support systems are now making a comeback.)

For a while in the early 1990s it seemed as if all the expert system software vendors and their rule-oriented products would disappear. They were saved by the insight that smaller rule-based systems—which are usually called *knowledge systems*—could be very valuable. Moreover, if one focused on business rules that are derived from company policies and were used in routine decisions the rule bases do not get too large and the knowledge doesn't change nearly as rapidly as the knowledge possessed by cutting-edge human experts. In other words, don't try to build an expert system to predict the stock market; focus instead on developing smaller decision systems to help loan officers make routine loans for autos or houses. Better yet, focus on helping clerks make decisions about the most cost-effective way to route shipments to various distributors.

Every organization has hundreds of processes that require decisions. A quick calculation will show that, if you could improve each of those decisions so that the average employee consistently did as well as the best employee, your organization would be making a lot more money.

At the same time that the early business process management software (BPMS) vendors were offering the first BPMS products a variety of consultants were offering to help companies define their business rules, and in many cases were happy to show them how to automate their business rules in simplified expert system tools. Having developed from two different technological traditions there was initially little in common between marketing presentations of process and rules vendors.

Within a short time, however, a couple of the leading business rules vendors decided that they could reconceptualize their tools to serve the BPMS market. The rules vendors already had the concept of grouping rules into objects with various kinds of inheritance. Now, instead, they grouped rules into business processes and used the rules to manage the decision-making activities that occurred within various activities.

Many of us who work in process analysis, however, have long realized that there was something missing. In essence, rules are a very fine-grained way of talking about the decisions that take place within processes.

In the past decade the *business rules* marketplace has begun to change and is now more commonly described as the *decision management* market. This in turn has accelerated the merger that has been occurring between business rules and BPMS vendors and consultants. IBM and many other BPMS vendors now treat BPMS and business rules—which they now term decision management—as two sides of the same coin. One uses BPMS to describe what the organization is trying to do. Then, as one drills down, another looks at specific process activities and decides if they are essentially procedural or if they involve decisions (or a mixture of both). If the activities involve decisions, then one considers using decision management techniques to describe the decision logic of the activity.

To formalize this emerging understanding the Object Management Group (OMG) has established a task force to consider how rules, decision management, and processes ought to work together and this task force is currently working on a draft *Decision Model and Notation* (DMN).

Figure 10.10 illustrates the high-level model that the OMG has included in the current draft of their DMN document. (I have expanded the diagram in the OMG DMN 1.0 draft document to incorporate some items that are discussed in the model but were not shown in their current diagram.) At the top is a BPMN process model that includes an activity in which a decision is made: in this case whether or not to accept an application. The activity *Decide Routing* includes a small icon for business rules (which in a future version of BPMN will probably be renamed "Decision").

What DMN provides is a way to think about how the decision in the activity to be made can best be described. DMN begins with a *Decision Requirements Diagram* (DRD). A middle layer of abstraction that lies between the process activity and the business rules is what has been missing in standard business rules formulation.

The DRD includes several elements. First, there is the *decision* or decisions that are taken during the process or activity being referenced. These decisions are often arranged in a hierarchical manner and numbered. Second, there is the *business knowledge* required to make the decision—what we would have captured in a semantic net and the knowledge base in a classic expert system. Third, there are *input data* from the external world that are required to make the decision—whether from a user, a database, or an application. The DRD may also include information on the *knowledge source*—the person, book, or whatever the organization relies on to validate and update business knowledge. I won't go into the details at this point. But, there are mid-level concepts, which make it much easier to define the initial decisions that take place in process activities, situated between decisions and business knowledge models, on the one hand, and input data, on the other. (The DMN standard also introduces a new software language—FEEL, based on XPath and Java—that can be used by software developers to define the decision logic level with precision.)

Figure 10.10 illustrates a very simple decision process. There could be many different decisions, and DRD even allows for the possibility that decisions could be decomposed into smaller DRDs.

Separate from the DRD there is *decision logic*. Decision logic could be a decision table, business rules, or an executable analytic model. The latter is important because it is at this point that business rules and analytics merge—both are simply types of supports for decisions.

Obviously, one block of business knowledge could contain dozens or hundreds of tables or business rules. (Business rules are increasingly represented on spreadsheets in decision table format. They don't have to be, but many business people find this representation the easiest to understand.)

The DRD and decision logic collectively comprise a *decision model*, and the specific elements illustrated in Figure 10.10 constitute the notation.

Finally, at the lowest level in Figure 10.10 we have what is termed a *decision service*. In essence, a decision service is a software application that automates some or all of a Decision Model.

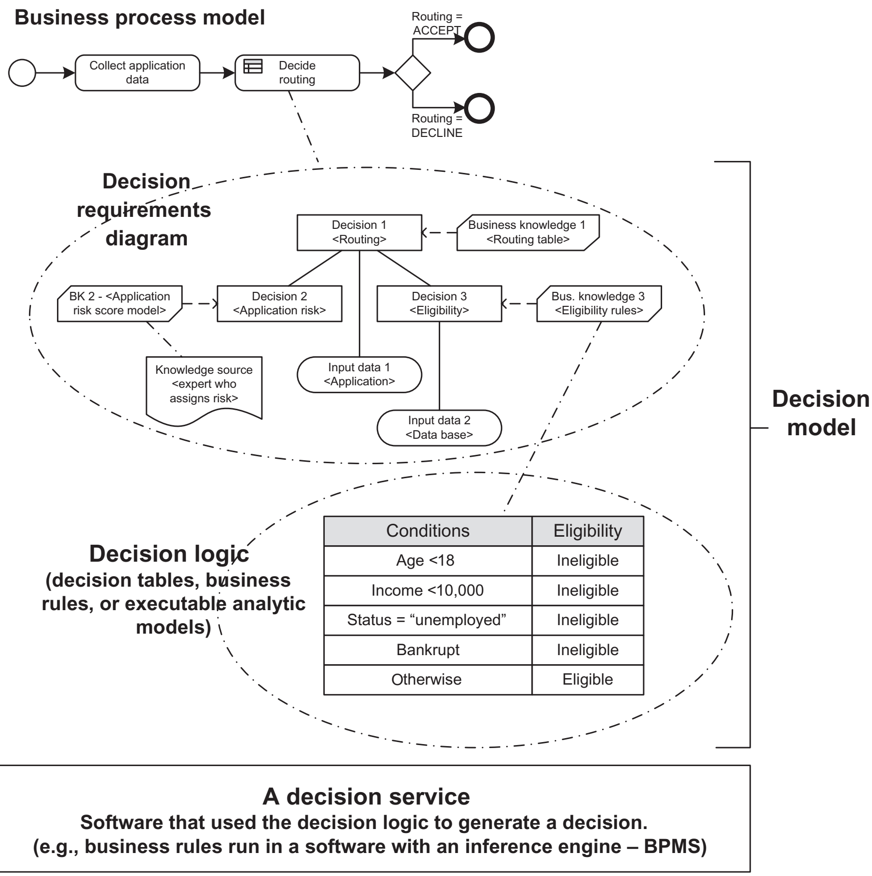


FIGURE 10.10

OMG's Decision Management Model.

From OMG's Decision Model and Notation.

The entire DMN being developed is compatible with BPMN and with various BPMS standards. Thus this notation makes it possible for process developers to create models that describe high-level process flows, the decisions required by various specific process activities, and the tables or rules (on analytic models) required to make the decisions.

Taken together the BPMN and DMN represent a merger of business process and business decision (or business rule) technologies. This is a major step forward in our ability to smoothly integrate these two seemingly separate technologies into a common approach.

DMN is not complete yet. There will probably be at least one more draft. Similarly, slight changes will probably take place in the next release of BPMN to support integration of the two standards. We will continue to report on developments as they occur. At this point, however, enough has been done to make it clear that henceforth processes and decision management will be part of any comprehensive business process improvement effort. Moreover, this work already makes it important that business process professionals add the ability to describe decision requirements to their basic set of process analysis tools.

Obviously, decision management can be automated by incorporating business rules in a software application, but decision tables or business rules can just as easily be put on paper job aids or in employee procedure manuals. The media may vary, but the key to good decision management is to assure that the right information and the right rules are available and used.

Knowledge Workers, Cognitive Maps, and Decision Management

People are at the heart of any organization. They set the organization's goals, they manage it, they deal with customers, and they work together to produce the organization's products and services. Figure 10.11 describes some of the types of processes and the types of jobs that occur in any company. Simpler processes can be done by individuals who simply follow procedures. More complex jobs require workers who think. In some cases workers simply analyze a situation—using established business rules—and decide which of several alternative paths to follow, but in more complex cases they analyze, diagnose, design, redesign, program, plan, or schedule. In some cases they create new products, new processes, or entirely new ways of positioning a product or the company. Very complex jobs require individuals who can analyze and solve very complex problems.

It's commonplace to observe that the United States has become a service economy that is run by knowledge workers. In other words, many US companies have lots of knowledge workers doing more complex tasks than in the past. One need only think of a software firm that employs hundreds of software architects, designers, and programmers, a movie company with all the specialists required to create a movie—from writers and actors to directors and special effects people—or a financial firm

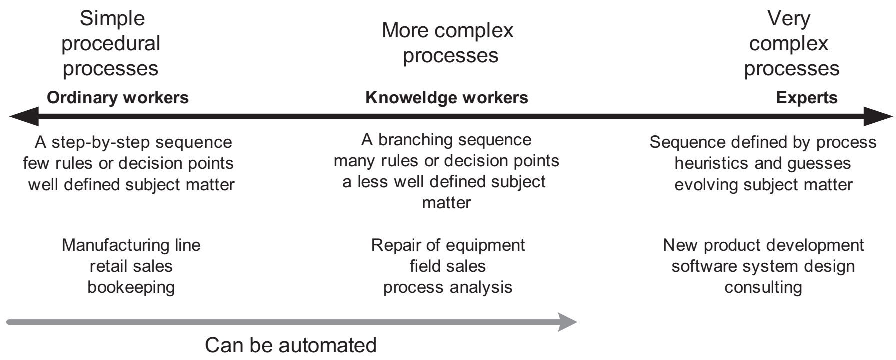


FIGURE 10.11

Process-knowledge continuum.

with specialists who help individuals create and manage their financial portfolios. Knowledge workers create special problems for those who must recruit and manage them. Managers need to be especially careful in designing performance reviews and incentive and motivation programs for such individuals. If you think of the CEOs and senior managers in a firm as the ultimate knowledge workers you can see what kinds of problems boards encounter when they seek to define their goals or motivate them.

Knowledge workers also create special problems for anyone who tries to analyze the processes they implement. These usually aren't processes one would try to automate, although the processes typically rely on complex software systems that knowledge workers themselves use to perform their work.

Don't misunderstand. It's easy to diagram a supply chain that employs hundreds of knowledge workers and experts. One can easily decompose the analysis from Level 1 processes to Level 2 or Level 3 processes, and identify just what activities each knowledge worker or expert is expected to accomplish and when it is to be performed. The problem comes when you try to move lower and define the specific procedures that individual knowledge workers or experts are to follow when they perform their daily tasks. That's usually hard and in some cases it's impossible. The work involves thought and creativity, and we simply don't have good tools to use to capture those kinds of processes. Imagine trying to define the specific steps in *determine new ad campaign*, or *design new software screens*.

One problem process analysts face when they seek to define the specific procedures that knowledge workers perform arises from the fact that knowledge keeps evolving. Thus knowledge workers, to remain useful, need opportunities to learn new theories, facts, and procedures. They need training and they need to network at conferences and with peers within their organizations.

Many knowledge management (KM) programs are focused on providing ways to facilitate the sharing and accumulation of insights acquired by knowledge workers. Some KM programs provide websites where knowledge workers can describe their insights to others facing similar problems. Others provide summaries of new articles or new procedures. Still others simply list individuals with skills, so those in need of help or advice know where they can turn.

A related problem is that knowledge workers often need to communicate with others as they solve problems. Email has become one of the most important tools in many companies. Groupware represents an effort to facilitate such interaction, and it will become more important as international companies increasingly build teams that require the participation of knowledge workers from different countries around the world.

As you think about these issues, imagine diagramming a process that includes steps that depend on the exchange of email between dozens of different employees at different locations around the world. High-level diagrams that don't try to capture the details are easy enough to draw, but a diagram that might someday be automated by being turned into a BPMS application can be pretty daunting.

It's important to distinguish between knowledge workers and true experts. Experts typically require 10 years to become really expert. Studies have shown that they understand the problems they face by means of very complex networks of cognitive concepts and solve problems by employing thousands of rules. A physician who diagnoses meningitis infections typically employs 10,000 rules to determine what type of meningitis he or she is faced with. Moreover, those rules change and are reorganized each month as the physician reviews new studies being published in the relevant medical journals. It is rarely cost-effective to try to automate the work of a human expert. As expensive as it is to maintain such experts it is cheaper to hire them and pay them to remain up to date than to try to capture and automate their knowledge.

Most knowledge workers, on the other hand, do not employ such complex cognitive networks or use quite so many rules. A knowledge worker often employs a few hundred rules to solve the problems he or she encounters. In many cases process practitioners are asked to analyze the jobs of knowledge workers. This is particularly true in high-turnover organizations, like the US Army or Air Force, where people need to be rapidly trained to perform complex jobs that they may only occupy for 3–5 years. Similar situations occur in other domains when new technology is introduced and knowledge workers need to rapidly learn to perform in new ways.

This usually entails analysis of the knowledge used by the knowledge worker—and the capture of that knowledge in some form—as well as the development of complex software programs or training programs to pass that knowledge on to new workers. In this case the process analyst needs to do cognitive task analysis, capture and document knowledge structures and knowledge rules, and then work with others to create training or software systems to deliver the information and skills to the workers who will need them. This isn't something taught when beginning process analysis courses, but these tools will increasingly be required of process professionals as they seek to redesign complex processes.

When we first started analyzing human performance problems in the late 1960s the techniques we used were generally termed "behavior task analysis." This term reflected the dominant trend in psychology in the late 1960s—behaviorism—which stressed observation of overt activity. Broadly, behaviorism represented a revolt by academic psychologists against the cognitive psychology that had predominated in the late 19th century. Psychology in the 19th century had relied on introspective reports of individuals and had led to Freudian psychoanalysis, which most serious psychologists regarded as unscientific. Behaviorism stressed the systematic observation of behavior and careful measurements. Studies by Watson, Skinner, and others illustrated how the behavior of rats and pigeons could be controlled and predicted by observing the stimuli the animals were subjected to and by the consequences that followed. By the late 1960s behaviorism had made its way into industry and was being used in a variety of ways to improve the design and management of human performance. Thus behavioral task analysis focused on the documentation of stimulus-response sequences, and on designing work procedures that were more efficient.

By the late 1970s, however, most academic psychologists had returned to the study of cognition. Using new techniques, derived primarily from work with computers, psychologists began to conceptualize human performers as information-processing systems, and ask questions about the nature of human cognitive processing. The new cognitive psychology put its emphasis on observation and is at least as rigorous as behaviorism. An early classic of cognitive task analysis was Allen Newell and Herbert A. Simon's *Human Problem Solving* (1972). In it Newell and Simon analyzed a variety of human cognitive tasks, including cryptarithmetic, logic, and chess playing, and reached a variety of interesting conclusions that formed the basis for a decade of work in both cognitive psychology and AI. Indeed, it could be argued that their work led directly to expert systems—software programs that sought to duplicate expert human performance. The key point to make here, however, is that psychologists and computer scientists spent several years in the early 1980s developing techniques to capture human expertise and embed expert knowledge in software systems.

Those of us working in the behavioral paradigm had largely arrived at the same conclusion by a different route. In the early 1970s most of the processes we worked on involved procedural tasks—on manufacturing lines, for example—that really could be analyzed by observation. You studied the sequence of activities that the employees followed, and developed systems to make the flow as efficient as possible. Most of the problems that we encountered, by the way, involved managers who didn't define the tasks properly, provided inadequate feedback, or reinforced the wrong activities. By the late 1970s, however, most of the processes we were working on involved knowledge workers, although we didn't use that term back then. We did a lot of sales analysis, analyzed managerial decision making in a variety of contexts, and increasingly worked on financial operations that entailed computer interactions. It was common to encounter an activity in which the worker received a batch of information, stared at the computer screen for a few minutes, and then made a decision. Similarly, with sales a bank salesperson would interview a potential customer and then return to the office and write up a multipage proposal for a complex loan package. In these cases the "behavior" that was important was occurring inside the heads of the employees. They were thinking, analyzing, designing solutions, and making decisions—all things that behavior task analysis was unable to capture. It was precisely these types of process problems that led me to investigate cognitive psychology and to get involved in expert systems development.

Ultimately, expert systems have not proven very viable. It turns out that human expertise—if it's worthy of the name—needs to be constantly maintained. Human experts attend conferences, read books and research papers, and constantly interact with peers while trying to solve difficult problems. All this leads to their reformulating their knowledge. It is expensive to capture human knowledge for an expert system, but it is much more expensive to maintain that knowledge. In fact, it is so expensive that it turns out to be more cost-effective to just keep using the human experts. They will need to be maintained in any case, to keep learning and revising the knowledge that is required to make the expert system effective. Today the emphasis on AI has switched from business rules to a new technology, usually termed neural networks, that relies on probability models that are capable of learning. We will consider the implications of all this in Chapter 18.

This is not to suggest that all the work that went into expert systems development was in vain. We have, for example, developed some rather good ways of representing human knowledge. It turns out that expert decision making can be represented with rules. It is also obvious that human experts rely on cognitive models of the problem domain, which psychologists tend to call "cognitive maps" and which computer scientists usually call "object networks." In essence, the cognitive map allows the human expert to classify and organize the facts in the problem space, and the rules allow the expert to draw inferences and conclusions about how to deal with the problem he or she is facing.

Not many people are building expert systems today, but knowledge of the techniques used to develop expert systems has spread to other domains and found new applications. Thus today, when business process analysts are faced with tasks involving human knowledge, they are in a good position to draw on some of the techniques developed by cognitive psychologists and expert systems designers in the 1980s and 1990s.

If you think of a continuum that ranges from nonexperts to experts, knowledge workers lie in the middle (see Figure 10.11) A true expert, such as an engineer who could design an M1 battle tank, might have models with many hundreds of objects and use as few as 10 or as many as 20,000 rules. The soldiers who diagnose M1 battle tank problems in the field might only require 100 objects and 500 rules. The trend, in other words, is to ignore true expertise, which is too hard to analyze or maintain, and to focus on analyzing the knowledge that knowledge workers bring to bear on their more circumscribed tasks. The work of knowledge workers is, of course, very important and valuable, and if we can capture significant portions of it we can share it and use it to design processes that can contribute significantly to the value of our organizations.

There are two tools that cognitive analysts rely on heavily. One is the cognitive map, a diagram that defines the concepts and relationships between concepts that a knowledge worker relies on. The second is the rule that defines what a knowledge worker should do in the presence of a specific situation. Figure 10.11 illustrates a cognitive or knowledge map that describes the conceptual network of an individual who builds cognitive maps.

We do not have the space to go into cognitive task analysis or the capture of knowledge and the creation of concept maps in this book, but several books are listed in the Notes and References section for readers who have to deal with processes involving knowledge workers.

Business Rules and Knowledge Rules

The capture of rules is an even more complex topic. Companies have always had policies and rules to define what should or should not be done. Similarly, business rules have been written down in employee manuals for generations and are currently embedded in many legacy software systems. Today, however, business rules have achieved a new status as assets of a company that ought to be explicitly defined and managed.

A *business rule* is a statement that defines some policy or practice of the business. Business rules, whether implemented by employees or by automated systems, determine that appropriate actions are taken at appropriate times. Changes in company policies or practices invariably are reflected in business rules, and the ability to maintain consistency between policies and the business rules used in business processes, IT applications, and employee practices, especially when changes take place, has become a key characteristic of agile companies.

Today's efforts to formalize the capture and management of business rules originated in four different movements that have waxed and waned over the course of the last two and a half decades. A review of those movements helps explain the current situation in the business rules market.

Business Rules for Software Development

In the late 1980s there were a series of meetings of the IBM user group GUIDE at which technologists sought to define the business rules that software applications were written to implement. Programmers realized that different elements of their software applications changed at different rates. The data that a company collected, for example, changed relatively slowly. Business rules, which often incorporated specific business assumptions—information about specific interest rates or types of clients, for example—tended to change much more rapidly. Thus many software architects began to believe that business rules should be formalized and stored independently of the software applications in which they are used. Properly organized, software applications would simply look up rules as they were needed. This would mean that business managers could change the business rules as needed without having to reprogram software applications.

Many of those who advocated the formalization of business rules believed that rule formalization should be a top-down effort. Executives ought to define strategies and goals and those should be translated into formal policies. Those policies in turn should be translated into high-level business rules, which should then be translated into more specific business rules.

Anyone who has undertaken a rules documentation effort knows that, if one isn't very careful, one soon runs into problems with the specific terms and names in the rules.

To create a formal system of rules one must simultaneously create a formal vocabulary. In other words, everyone in the company must use words such as "customer," "account," and "primary account number" in the same way. One needs a formal vocabulary (or concept map) to assure that a rule that states "all customers are assigned one and only one primary account number," will be unambiguous and interpreted in the same way by everyone throughout the company. At a minimum we need to define "communities" that will use the same words in the same way. Thus, business rule methodologists are usually concerned with the formalization of both business vocabularies—sometimes called an *ontology*—and business rules for companies or for communities within a company.

Most business software products use a repository to store information about rules. In effect, as one writes rules one is also creating and maintaining an object attribute network that specifies the terms used and the relationships between terms.

Unfortunately, large companies are usually broken down into many divisions and departments that are spread throughout the world. Getting management to spend the time required to formalize a corporate business ontology and then proceed to define formal business rules has proven very difficult. It's a huge undertaking and most companies have been unable to justify the effort. Those that have—several insurance companies, for example—have been companies from industries that were already inclined to think in terms of very precise rules. Others have created rules and an associated ontology for only one division or one group within the company.

Figure 10.12 suggests how someone advocating a comprehensive rule formalization effort might conceive of the effort. In essence, they would start at the enterprise level and work with executives to formalize the company's policies and create a formal

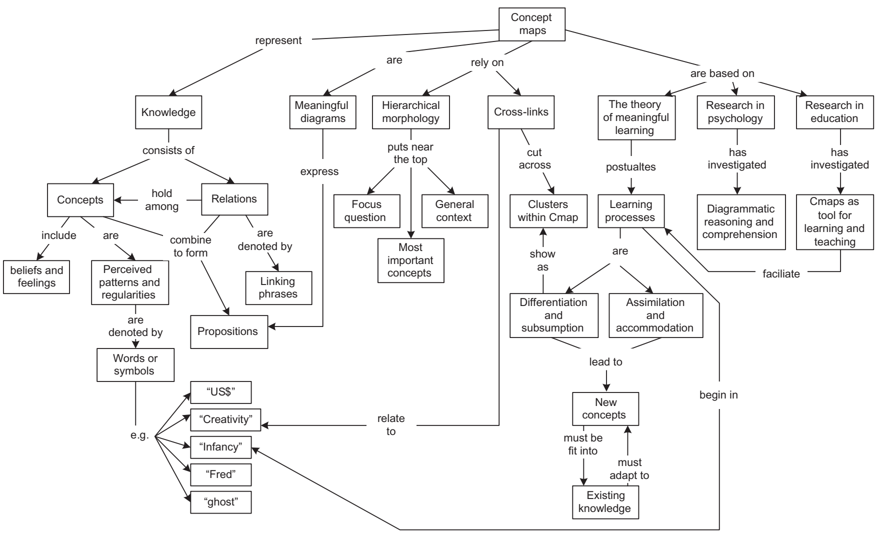


FIGURE 10.12

Concept map about concept maps.

From Crandall et al., Working Minds.

ontology and appropriate business rules. Then they would work down through divisions and departments, formalizing their ontologies and business rules, constantly being sure that lower level ontologies and rules were clearly aligned with high-level rules. Finally, they would reach the implementation level and check to see where business rules appeared in procedures manuals, training courses, and in software applications and assure that those implementations used rules clearly derived from high-level rules. In the end, if a company persevered they would have a complete description of all the rules used in the organization. Subsequently, a change in policy would drive changes in high-level rules and those changes in turn would work their way down through the entire organization, assuring that all rules were changed to reflect the changes in policy.

The theory behind such a comprehensive, rule-oriented approach is sound, but the problems involved in actually capturing and maintaining it are significant, and the effort has not been one that most companies have chosen to undertake. One problem that faced anyone considering such an effort in the 1980s was that most of the advocates of this approach were database technologists, and the databases being used at the time were not very well designed to support this approach. Thus, although many people appreciated the power of the "rules approach," it didn't gain much traction until recently, when new tools became available.

Rule-Based Systems for the Capture of Expertise

Another approach to rules was undertaken by the expert systems movement of the mid-1980s. Expert system development, as we mentioned earlier, derived from research in AI and focused on capturing the rules used by experts to analyze and solve very hard problems. For example, systems were developed to analyze readings from geological equipment and to determine constantly changing seat prices for airlines. Expert systems development was facilitated by software tools (expert system–building tools) that stored the rules in a knowledge base and used an inference engine to examine facts and rules when a decision was required and to generate a decision.

As already noted, some of the expert system applications that resulted from these efforts proved very valuable, but most proved too hard to maintain.

In the mid-1990s, as interest in the capture of expert knowledge waned, many of the vendors who had provided expert system–building products repositioned themselves to provide support for those who were interested in capturing and using business rules. Expert rule sets had proved too unstable and hence too difficult to maintain, but business rules tended to be more stable and to change less frequently. The rule tools originally developed to support expert rule sets turned out to be much better for maintaining business rule sets and supporting the types of rule changes that business managers wanted to make. Thus in the late 1990s the IT rules documentation movement and the expert system–building tool vendors had largely joined forces.

Risk Management and Compliance Issues

Corporate executives have always been concerned with whether employees are in fact following corporate policies. Many industries are regulated and there are laws that require that certain types of companies report on compliance. Recently, Sarbanes-Oxley and related regulations have been promulgated that require that companies demonstrate that they are able to track changes in processes that might lead to a compliance failure. The various concerns have placed a new emphasis on both formal business rule systems that can track compliance from policies to high-level rules to specific rules in software programs and employee manuals. At the same time these same regulations have encouraged companies to develop formal descriptions of key business processes and to show where business rules within those processes assure compliance with government regulations. These legal and management concerns have highlighted the importance of a well-managed business process effort that documents not only processes but business rules.

Business Rules Used in Business Processes

In the 1990s considerable attention was focused on reengineering major business processes. To understand a business process, analysts usually began by creating a diagram or model that showed the major steps or activities that occur during the process. At the simplest level, business rules were often pictured as decision points within a process workflow diagram. Thus a rule that said that loans should only be granted to applications that meet the company credit standards might get represented in a flowchart as shown in Figure 10.13.

More complex decisions might also be formalized by means of business or even expert rules. For example, in Figure 10.13 the process analyst might decide to get very explicit about how one determines the terms and interest for a specific loan application. It could easily turn out that 100 different rules were involved in determining the terms

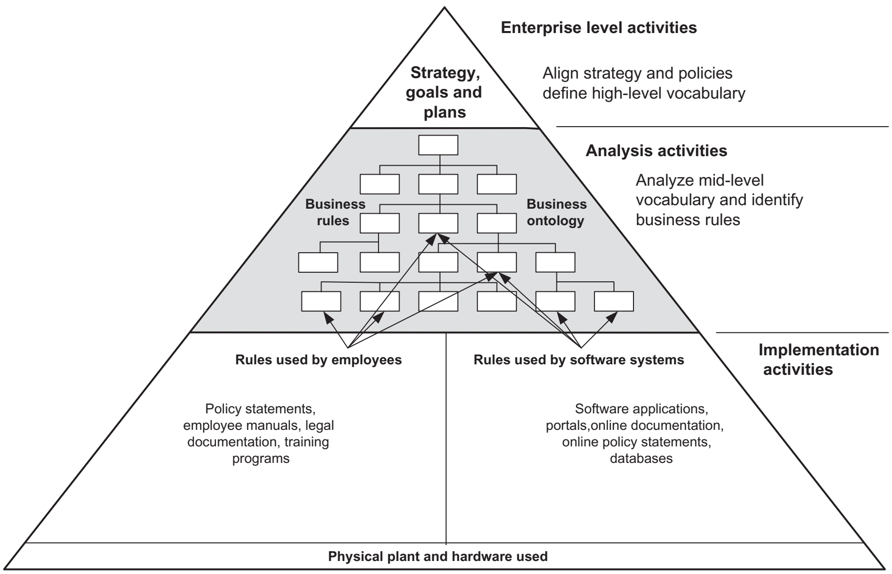


FIGURE 10.13

Systematic, top-down approach to business rules.

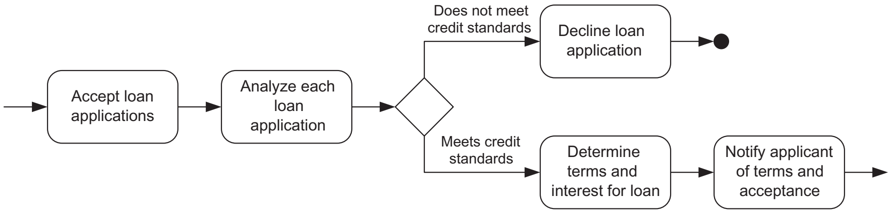


FIGURE 10.14

Workflow diagram with a business rule that defines a decision *diamond*.

and interest for a specific type of loan. In this case the rules are not shown explicitly as a decision box, but are in effect inside the *determine terms & interest for loan* activity box. (In many process-modeling software tools one can literally click on the *determine terms & interest for loan* activity box on a diagram and open a window to the business rules documentation environment.) Clearly, the rule represented by the decision diamond was a business rule. The rules used to determine the terms and interest for the loan were probably also business rules, although some decisions in some processes can become so complex that they are in fact knowledge rules. In other words the rules are not so much defined by explicit policies as by experts who are hired to make the decisions. As process analysts examined ever more complex processes they found that the capture of business rules was an important part of most business process redesign efforts.

Figure 10.14 suggests some of the relationships we have been discussing.

Business rules are derived from common business knowledge often formalized as policies, whereas expert rules are derived from human experts and not formalized. Both are found in business process analysis efforts.

Just as business rule advocates proposed a top-down approach most business process architects have urged companies to begin at the enterprise level and define high-level processes—usually called value chains—and then subdivide those to define a hierarchy of business processes. In a similar way, they have advocated that companies align their strategic goals with their value chains and major processes and develop measurement and management systems to support all their processes.

In Chapter 17 we will discuss BPMS products. Most of those products incorporate a business rules engine, and we will discuss tools that can automate the use of business rules at that time.

Notes and References

For more on ABC see the following books.

Staubus, George J., *Activity Costing and Input–Output Accounting*, Irving Press, 1971.

Books published by the Consortium for Advanced Manufacturing-International (CAM-I) are available at http://www.cam-i.org.

Cokins, Gary, *Activity-Based Cost Management: An Executive's Guide*, Wiley, 2001.

Kaplan, Robert S., and Robin Cooper, *Cost & Effect: Using Integrated Cost Systems to Drive Profitability and Performance*, Harvard Business School Press, 1998.

Kaplan, Robert S., and Steven R. Anderson, *Time-Driven Activity-Based Costing: A Simpler and More Powerful Path to Higher Profits*, Harvard Business School Press, 2007.

The basic ideas of how to approach the analysis of specific human activity derives from the work of Geary Rummler and others at the International Society for Performance Improvement (ISPI). ISPI grew out of the behavior psychology movement in the 1960s, and led to the development of a general theory of how to design effective training and motivational systems, which is today generally termed *human performance technology* (HPT) or *human performance improvement*. More information is available at http://www.ispi.org.

Rummler, Geary A., *Serious Performance Consulting: According to Rummler*, ISPI/ASTD, 2004. This is the best book available on HPT and business processes. Every business process analyst who attempts the analysis of activities that involve human performers should read this book. There is nothing else remotely like it for its clarity and practicality.

Gilbert, Thomas F., *Human Competence: Engineering Worthy Performance*, McGraw-Hill, 1978. Gilbert was one of the people who created HPT in the 1970s, and this book provides a thought-provoking introduction to the field. Gilbert is extremely idiosyncratic and can be technical, so you've really got to be interested in human performance issues to get through this.

Gilbert developed the idea of PIP (potential for improved performance) as a way of measuring the possibility of performance improvement in given situations. In essence, you measure the performance of the best performer(s) and compare it with the performance of average performers. If the gap is very narrow there isn't much potential for improvement, and the variation is likely because of chance. If the gap is great, then you need to find out what accounts for the difference, and train or motivate average performers to act like the best performers.

Recent books in the human performance tradition that are worth studying include:

Addison, Roger, Carol Haig, and Lynn Kearny, *Performance Architecture: The Art and Science of Improving Organizations*, Pfeiffer, 2009. A very nice introduction to the key concepts of HPT by the retired CTO of ISPI.

Rummler, Geary A., Alan J. Ramias, and Cherie L. Wilkins, *Rediscovering Value: Leading the 3-D Enterprise to Sustainable Success*, Jossey-Bass, 2011. A more advanced introduction to the latest thinking of Geary Rummler.

Information on the analysis of sales performance is from a sales performance workshop I gave at ISPI in the 1970s.

Curtis, Bill, William E. Hefley, and Sally A. Millor, *The People Capability Maturity Model: Guidelines for Improving the Workforce*, Addison-Wesley, 2002. This is a book that starts with the premises of CMM and then studies how one improves the workforce to move from one level of process maturity to another. Bill Curtis wrote that it was this book that started him thinking of applying CMM to processes other than software processes.

Newell, Allen, and Herbert A. Simon, *Human Problem Solving*, Prentice-Hall, 1972. The critical, early work on cognitive psychology and artificial intelligence.

Crandall, Beth, Gary Klein, and Robert R. Hoffman, *Working Minds: A Practitioner's Guide to Cognitive Task Analysis*, MIT Press, 2006. This book provides a very nice introduction to cognitive mapping and cognitive task analysis.

Lindsay, Peter H., and Donald A. Norman, *Human Information Processing: An Introduction to Psychology*, Academic Press, 1972. This textbook is out of print, but used copies are available at http://www.amazon.com. It provides a really excellent introduction to all the basic cognitive analysis concepts, including mapping.

If you are interested in a more complete guide to acquiring knowledge, and want to get a book that is more advanced than *Working Minds*, I recommend:

Scott, A. Carlisle, Jan E. Clayton, and Elizabeth L. Gibson, *A Practical Guide to Knowledge Acquisition*, Addison-Wesley, 1991. This book represents an excellent synthesis of the techniques used by leading expert systems developers. The same concepts and interviewing techniques described in this book can be just as well applied to the analysis of tasks that knowledge workers face. *Knowledge Acquisition* is no longer in print, but I notice that some used copies are available at http://www.amazon.com.

There are many books on the management of organizational knowledge. Three that I often recommend are:

O'Dell, Carla, and Cindy Hubert, *The New Edge in Knowledge*, Wiley, 2012. This book is written by two of the leaders of the field who work at APQC, where they study how companies are achieving results with this technology.

Davenport, Thomas H., *Thinking for a Living: How to Get Better Performance Results from Knowledge Workers*, Harvard Business School Press, 2005. This is an excellent, high-level look at the problems managers face in dealing with knowledge workers.

Hall, Curt, and Paul Harmon, *The BPTrends 2006 Report on Business Rules Products*, May 2006. In 2006 BPTrends published a report by Curt Hall and Paul Harmon that reviewed business rule technologies and some of the leading business rule products currently in use. This report is free and is available at http://www.bptrends.com (search for BPT Product Reports). I owe many of my ideas on business rules to discussions with Curt Hall.

The OMG has developed a business rules standard that anyone interested in business rules development should study. It is available at http://www.omg.org (search for Business Semantics of Business Rules). If you are interested in decision management you will want to obtain and study the latest copy of the OMG's new work on *Decision Model and Notation* (bmi/2012-11-12).

If you want to learn more about the decision management approach I recommend the following three books:

von Halle, Barbara, and Larry Goldberg, *The Decision Model*, CRC Press, 2010.

Taylor, James, *Decision Management Systems*, IBM Press, 2011.

Fish, Alan N., *Knowledge Automation*, Wiley, 2012.

The Business Rule Community, a group that discusses various business rule issues and offers white papers on various topics, provides information on the various approaches to business rules that is available at http://www.brcommunity.com.

Ross, Ronald G., *Business Rules Concepts: Getting to the Point of Knowledge* (2nd ed.), Business Rules Community, 2005. An excellent introduction to the concepts and techniques involved in business rules that is available at http://www.brcommunity.com.

Morgan, Tony, *Business Rules and Information Systems: Aligning IT with Business Goals*, Addison-Wesley, 2002. This is another good introduction to the importance of specific business rules and how they can be used to align business goals with specific processes and activities.

Mitra, Amit, and Amar Gupta, *Agile Systems: With Reusable Patterns of Business Knowledge*, ARTECH House, 2005. This is a rather technical book that proposes that organizations develop comprehensive knowledge-based systems to describe complex business processes. This is very much in the spirit of the knowledge-based systems movement of the 1980s, and proposes the development of systematic ontologies and inheritance hierarchies that could be used to structure business rule systems. This is a very important book, but only those considering a heavy investment in business rules will want to read it.

Harmon, Paul, and Curt Hall, *Intelligent Software Systems Development: An IS Manager's Guide*, Wiley, 1993. This is an older book, but provides a good technical introduction to the concepts used in expert systems and business rule systems.

CHAPTER

Managing and measuring a specific business process 11

In this chapter we want to consider how the management of a specific business process affects the performance of the process. In Chapter 5 we discussed some of the issues that companies face in organizing process management. In Chapter 6 we considered some of the enterprise issues faced by companies trying to organize a corporate performance measurement system. Here our focus is much narrower. In Chapter 10, when we talked about the kinds of problems analysts find when they try to improve specific activities, we described several problems that derived from the way supervisors and local managers interacted with employees trying to accomplish specific activities. Here we want to consider how a business process redesign team might go about analyzing how a specific business process is managed and what changes they might recommend to improve the specific process.

The work required of a process redesign team varies according to the process maturity of the organization. If the organization is a Capability Maturity Model Integration (CMMI) Level 4 or Level 5 organization it will have an enterprise process management system in place and will already have a performance measurement system defined. In this case the team will check to see if established process management policies and procedures are being followed. In less mature organizations—and most organizations lie somewhere between CMMI Level 2 and Level 3—process management will be more informal and the redesign team will have to examine the management of the process carefully to determine if the manager is implementing the basic process management principles. If not, then the process redesign team will have to recommend that more effective process management practices be established and implemented.

In Chapter 4, when we discussed enterprise architecture issues, and in Chapter 8, when we discussed how to analyze process problems, we considered two types of management processes. One type operates at a distance from the specific process being analyzed. The scoping effort may identify it and suggest it be included within the scope of the project, but in most cases it will not be included. Thus the project team may suggest that the management process that generates corporate credit policies change certain policies, but it will not focus on the actual management of the credit policy process. The second type of management process describes what the specific manager in charge of the specific process does to facilitate the day-to-day operation of the process. Figure 11.1 shows the analysis we did of a pizza organization in Chapter 8. In this case the process-in-scope—the *provide delivery service* process—has specific management

Business Process Change. https://doi.org/10.1016/B978-0-12-815847-0.00011-X

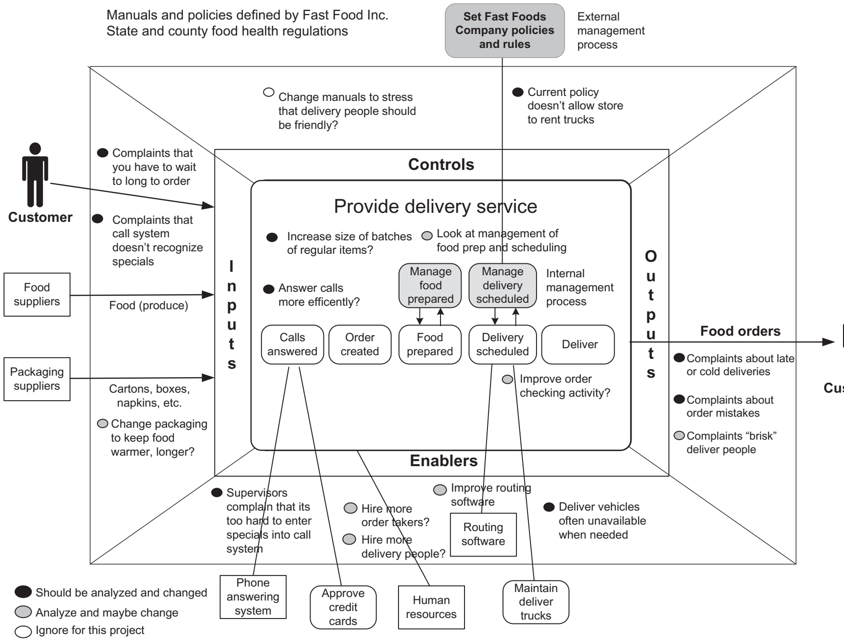


FIGURE 11.1

Two types of management processes: those outside the process-in-scope *(dark gray)* and those inside the process-in-scope *(light gray)*.

processes associated with its activities. Separately, there are external management processes that generate company policies and rules.

For the purposes of this chapter we will ignore the management processes that operate at some distance from the specific process being redesigned and focus only on the internal activities of the process manager who is responsible for the day-to-day operation of the process we are trying to improve.

Representing Management Processes

In Chapters 8 and 9 we considered what was involved in modeling processes. In most cases we begin by simply managing the operational processes we are concerned with and assume that each process we identify has a manager. Later, if management seems like something we should focus on—and it usually is—we can go back and represent management processes. Figure 11.2 shows how we informally represented the management processes involved in the *deliver pizzas* process. In this case we identify the management process that is responsible for the entire *deliver pizzas* process, and we represent the management role that is associated with each subprocess within the

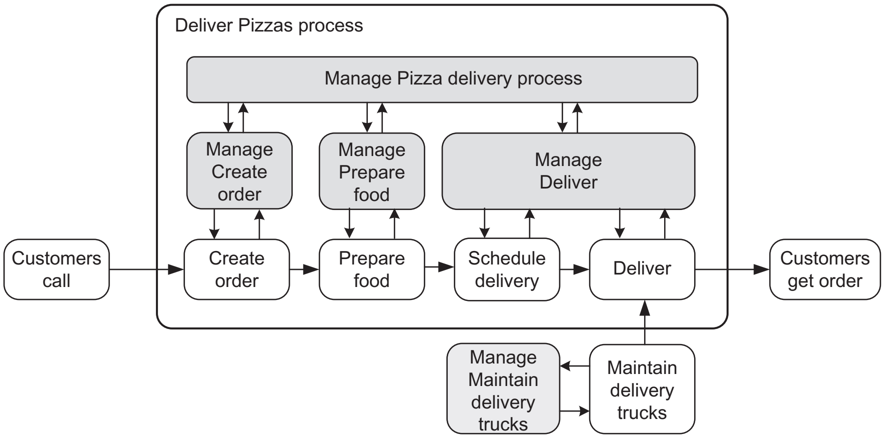


FIGURE 11.2

Business process diagram that pictures both the regular and the management processes.

deliver pizzas process. In this case, because we will also be looking at an external process that maintains delivery trucks, we also indicate that we will be looking at the management of the *maintain delivery trucks* process.

In an actual company some of the processes might be managed by the same person. Thus, for example, there might only be one manager for both scheduling and delivering pizzas and the analysis could be modified to reflect that.

If we create a swimlane diagram, then we usually represent the management of processes and subprocesses on the left vertical axis. In essence, a lane is within the responsibility of a manager. Depending on the level of detail we allow ourselves we might only show a process or department manager, but in Figure 11.3 we show each of the subprocess managers.

By adding to the structure of the swimlane diagram we can picture the hierarchical relationship between the manager of the food preparation process and the manager of the entire *pizza delivery* process.

The Management Process

Figure 11.4 suggests that an internal management process could be made up of four major subprocesses: *plan work*, *organize work*, *communicate*, and *control work*. Each of these subprocesses in turn includes a variety of different activities. Some of the activities, like *establish plans and schedules*, are complex and could easily be classified as processes in their own right. Thus we stress again that this overview of the management process is only one possible representation. As we saw in Chapter 5 several different frameworks have defined management processes, and each has grouped the tasks involved in different ways. It really makes little difference exactly how you conceptualize the management process at your company, but it is probably

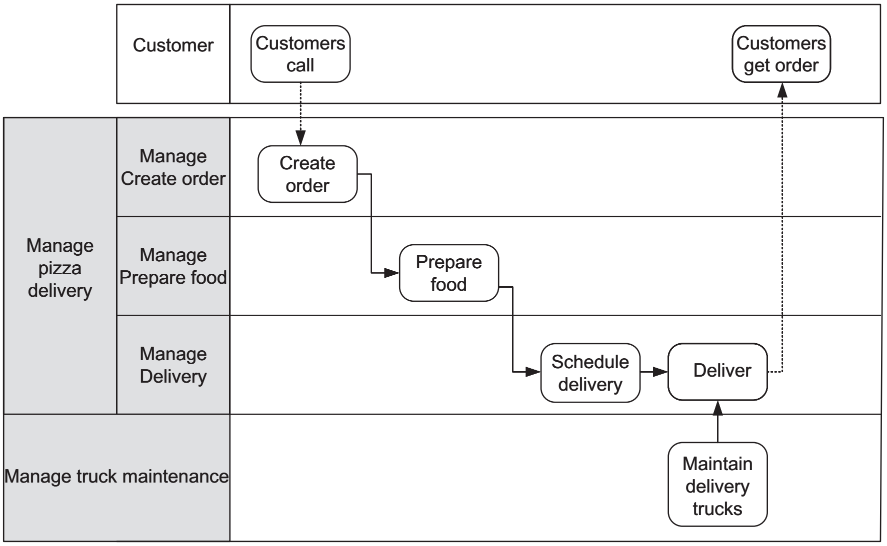


FIGURE 11.3

Swimlane diagram with management processes listed at the left.

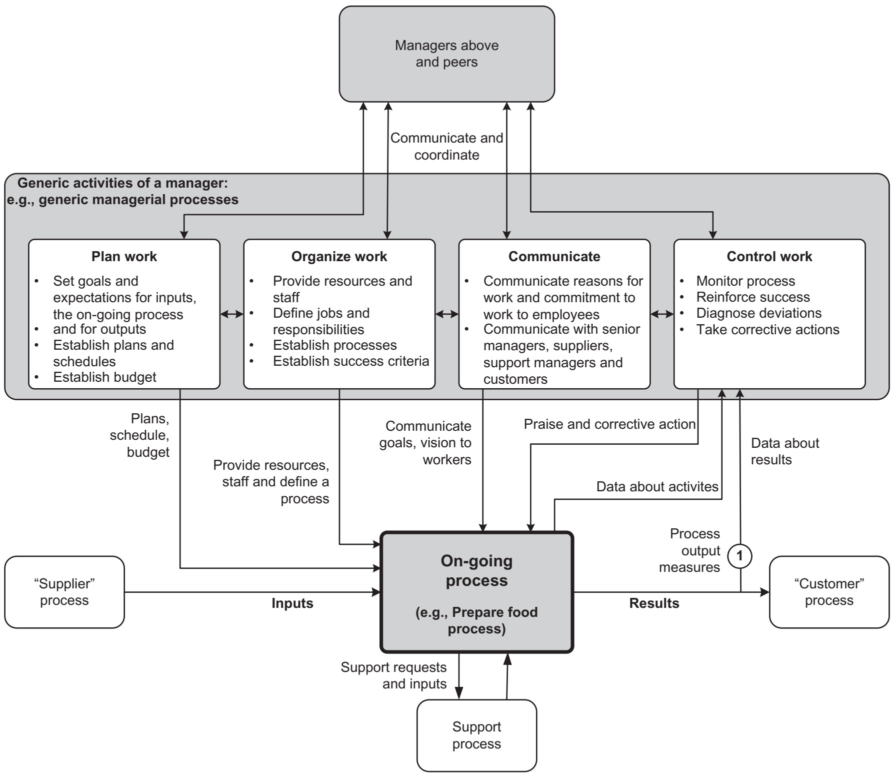


FIGURE 11.4

Basic subprocesses of the day-to-day management process.

best to agree on a single, standard way of talking about the management process to facilitate effective communication. Companies that have a business process management group usually assign that group the responsibility for training managers in business process management skills. In that case the business process management group usually standardizes on one generic model of business process management and teaches all managers to use the same terms and to follow the same best practices. Given our preference for *plan*, *organize*, *communicate*, and *control*, we will organize the rest of our discussion around those four basic process management subprocesses.

Plan Work

Much has been written on every aspect of management. Every basic introduction to management has sections on setting goals, planning, establishing schedules, and establishing a budget. We have nothing to add to the popular or technical literature on any of these topics as they are generally conceived. We can make some specific comments with regard to planning and process redesign.

If you are on a project redesign team and are asked to analyze a process you will usually begin by figuring out the basic activities or steps that make up the process. Assuming the process has been performed for some time you can assume that goals, plans, schedules, and a budget are in place. As you talk with employees and managers concerned with the operational aspects of the process you should remain alert for complaints that suggest that employees do not understand the goals of the process or that well-understood plans or schedules are missing. Similarly, you should listen to see that needed resources are provided. If an activity fails to function correctly because it is understaffed or because needed resources are unavailable you will want to note that, and it will suggest that you will want to talk with the process manager about why he or she thinks those problems have occurred. In an ideal world, when a new manager takes over the responsibility for a process, he or she ought to review all the assumptions and ensure that plans, budgets, and schedules are adequate for the objectives of the process. If they are not they should be altered. Unfortunately, too often a new manager will simply use the scheduling and budget assumptions of a predecessor, and this will lead to misalignments as time passes and procedures change.

If the organization you are analyzing takes processes seriously it may require the process manager to maintain "contracts" with his or her "customers" and "suppliers." We believe this is a powerful tool for both planning and ensuring that measurement goals are aligned. Figure 11.5 provides an overview of the possible contracts that any given process manager ought to negotiate and then manage.

Let's begin with the "customer" contract. The process manager ought to sit down with the downstream or customer process or processes and negotiate contracts that specify what his or her process—which we will term Process B—will provide to the customer. This contract, like any good contract, should specify what will be delivered, how it will be delivered, when it will be delivered, and where it will be delivered. It should specify the quality and the quantity of the items to be delivered. It

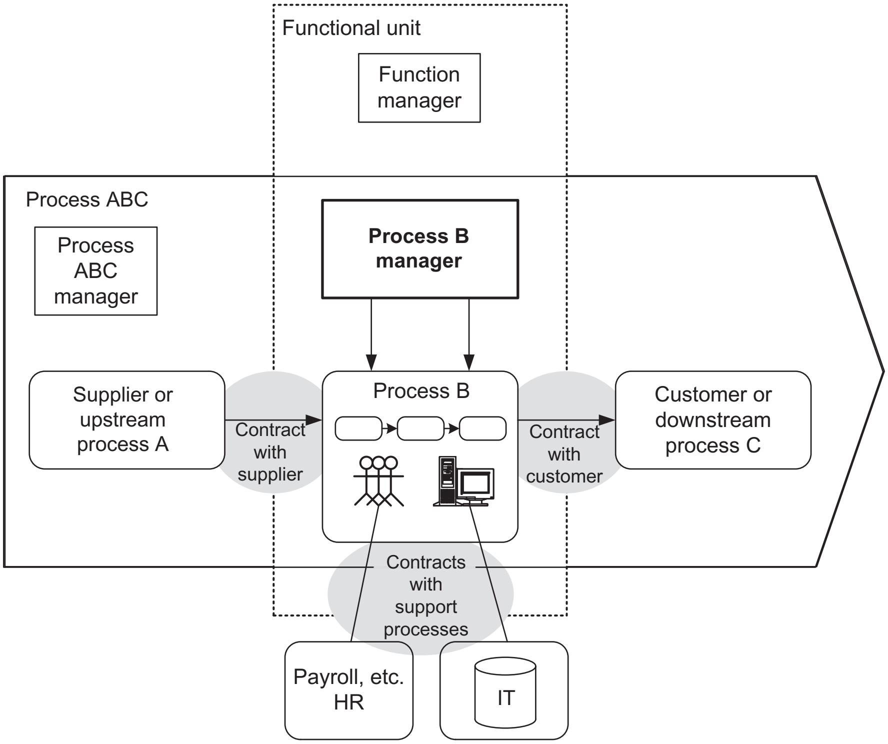


FIGURE 11.5

Contracts that a process manager ought to negotiate.

should cover special contingencies, like a situation in which Process C suddenly asks for twice the number of items originally scheduled for delivery during the upcoming week. The more specific the contract, the better. Once the contract is drafted, the Process B manager needs to get the approval of both his or her functional manager and any higher level process manager. Obviously, Process B's planning, scheduling, staffing, and budgeting will all be directly affected by the agreement. The manager of Process B cannot honestly "sign" a contract to deliver 50 assembled widgets to Process C if his or her functional manager will only approve a budget for the assembly of 30 widgets.

When we discussed enterprise measurement systems in Chapter 6 we distinguished between internal and external measures. The customer contract between Process B and Process C defines Process B's external measures. In essence, we are saying that Process B will succeed if it provides Process C with a set of agreed-upon inputs in the manner specified. That becomes the way we measure the success of Process B, the people working for Process B, and the process manager in charge of Process B.

If Process B and Process C were located within a single functional unit it would usually make the negotiation easer. If Process C is in another unit, which is still part of a larger functional unit managed by a single manager (say, they are both sales processes), that would also make the contract negotiation easier. If Process B is located in one major functional unit and Process C is located in another that tends to make the negotiation harder. Similarly, if the two processes are located in different geographical locations or different countries that can make the negotiation hard. The bottom line, however, is that you cannot align processes and you cannot ensure that Process B is delivering real value to the customer without an explicit contract. Your organization might not call it a contract, but everyone has to agree on the desired outputs of Process B, or any effort to improve Process B is just an exercise in futility.

Once the process manager pins down the outputs of the process he or she then needs to switch hats and function as the "customer" for other processes. The manager of Process B needs to negotiate a contract with Process A that will specify that Process B will get the inputs it needs to ensure it can meet its obligations to Process C. If Process B cannot get an acceptable agreement with Process A, then it will need to get senior managers involved or it will need to notify Process C that it will be unable to meet the contract that it reached with the manager of Process C. In a similar way, the manager of Process B will need to negotiate contracts with various support processes to ensure Process B will have the resources it will need from those processes. It may need help hiring and training new employees, or it may require a new facility or a new software application. It may need new software loaded on the desktop machines of Process B employees.

The point is that planning, scheduling, and budgeting are all exercises in which a manager determines what can be done within a set of constraints. The constraints are imposed on a process by outputs, inputs, and resources. Similarly, alignment with corporate goals is determined by agreed-upon inputs and outputs. These need to be determined before the process manager can generate effective plans, schedules, and budgets for the process he or she is trying to manage.

A process analyst examining a process will look to see if contracts exist. If they do not the analyst will have to generate them, at least informally, simply to determine how well the current process is functioning. Later, when considering recommendations, the analyst would naturally wonder how the process manager could do effective planning and scheduling without a clear understanding of the required output for his or her process, and probably suggest that as a major goal for the redesigned process.

Organize Work

Plans and schedules may assume resources, but then the manager needs to proceed and organize the resources. The steps in the process need to be defined. Jobs and roles need to be defined. Needed equipment and technical resources need to be put in place and coordinated. Once again, in most cases a new process manager inherits a process that is already functioning. If the manager is sharp he or she will review all the inherited assumptions. There are two guiding principles that the process manager will want to pursue. First, to be successful the process must meet the output requirements reflected in the contract negotiated with the downstream process. Thus the first goal of any organizational effort will be to ensure the process is organized in a manner that ensures that the output requirements can be achieved. Second, once the output requirements are being achieved the process manager should focus on improving the efficiency of the process itself. If the output requirements can still be met as a result of a process reorganization that reduces the number of employees, increases the productivity of existing employees, or consumes fewer resources, then that is invariably desirable. This is the time to look for waste and eliminate unnecessary activities. Because a major source of waste is rework this is also a time to consider how output consistency can be improved.

Put a different way, the first task of the process manager is to design or redesign the process to ensure it meets its output obligations. The second task is to work to constantly improve the internal working of the process.

Communicate

So far we have described the process manager's job in rather analytic terms. In fact, of course, process management involves working with people. Some would term this leadership, and others might term it teamwork. We simply use the term "communicate" to refer to all the activities that a process manager must undertake to ensure that the process runs smoothly and achieves its objectives.

A quick glance back at Figure 11.4 will suggest some of the types of communication that the process manager has to master. The process manager needs to communicate with the managers of the upstream and downstream processes and with the managers and employees of key support processes. The process manager needs to communicate with his or her functional or unit manager and with any process manager with responsibilities for a value stream that includes Process B. Finally, the process manager needs to communicate with the employees of Process B. Employees function best if they know why they are doing what they are asked to do. The process manager needs to communicate reasons for the process work and, to the highest degree possible, communicate commitment to achieving the goals of the process. Once again, there is much literature on communication and managerial leadership. It is easy to be glib about it, but it is important and it is usually obvious if it is missing or defective when you do an analysis of a process and interview employees and upstream or downstream managers.

Consider only one of the many types of communication that is required of a process manager. We have already suggested that the process manager needs to look for opportunities to improve the process and make changes in the organization of flow and the tasks performed to ensure that the process becomes ever more efficient and effective (or better, faster, and cheaper, if you prefer). At the same time the process manager is looking for opportunities to make changes; he or she should be aware that most people hate to change. Change causes discomfort. It requires learning new things, and it results in employees making mistakes as they try to implement new procedures. (The author of this book, for example, does everything he can to avoid upgrading to new software, knowing as he does that it will reduce his efficiency and increase his frustration when he tries to figure out a new way of doing things.) The process manager not only needs to identify opportunities for change he or she needs to be sure the change will really result in a benefit to the organization, and then he or she needs to sell the change to the employees who will be affected by the change.

Control Work

Finally, we come to measurement and the work a process manager must undertake to ensure that goals are met. Obviously, monitoring and control are related to the goals set in the *plan work* process. Similarly, all of the measures used in the process should be linked to the external measures developed during the *plan work* process when the project manager negotiated a contract with the "customers" of the process. In essence, the contract defines process success and, indirectly, the process manager's performance.

The *control* process relies on external measures to define internal process measures. Whereas external measures focus on the quality, quantity, and timeliness outputs, internal measures focus on the cost and the efficiency of the activities, and in some cases on the ability of the process to make changes in the internal process to ramp up output or reduce output in appropriate circumstances. At the same time the smart process manager will develop some leading indicators to make it possible to anticipate output problems.

One way to develop an overview of the kinds of measures that a process manager might consider is to divide the process into subprocesses and activities and consider where one might derive measures. Figure 11.6 uses a simple convention for identifying measures. Here we show a process with four subprocesses and several activities. (We have used a *jagged line* to reduce the size of the activities in this diagram.) At the top right we show the ultimate measure, which is labeled M1-E (Measure 1, External). This is an external measure directly tied to customer performance. The customer could be either a real customer from outside our company or the downstream process. If we were selling items it might simply be the number purchased. In the actual situation from which this example is drawn the company relied on answers to a questionnaire that the company asks a set of customers to complete periodically. Specifically, it refers to the percentage of customers who say they are satisfied with the repair and the percentage who say that the repair was done in less than 4 h.

If you write a contract with a "customer" process, then the M1-E and M1-I (Measure 1, Internal) are exactly the same. If you are dealing with a real customer you may still have a contract. In most cases, however, if you are dealing with a real customer there will be many customers and you will not have an explicit contract. In that case M1-E will probably be measured indirectly, by tracking sales, questionnaires, or some other means. In this case the organization will need to define its M1-I for itself,

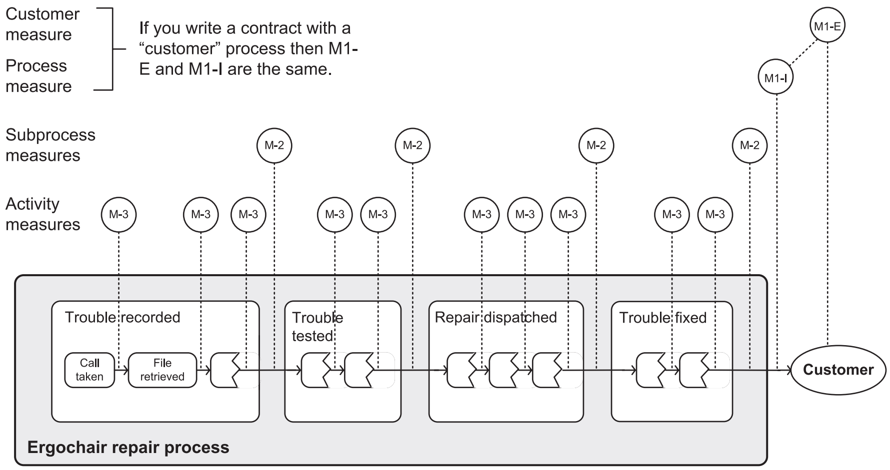


FIGURE 11.6

Measures for processes, subprocesses, and activities.

and modify its description as it gets feedback from customers. Whether the process manager uses an M1-E or M1-I, that measure or set of measures defines the goal of the process and determines if the process is a success. Internal measures that predict the achievement of M1 are good. Other internal measures that track cost or process efficiency or flexibility are also useful. In this case the internal measure is used to determine the overall success of the process. As it happens the internal measure checks the number of repairs that are done completely and accurately the first time.

A third tier of measures is provided by the four M-2 measures. They check the outputs of the four subprocesses. An example is the second M-2 from the left, which measures the output of the *trouble tested* subprocess. Specifically, this measure checks the percentage of testing errors, the elapsed time in testing, and the time taken per test.

M-2 measures are checked by both the process manager and the process managers in charge of subprocesses. They measure the success of subprocesses. In effect, well-defined subprocess measures ensure that the handoffs between one subprocess and another are up to standard.

M-3 measures check the success of specific activities. They are monitored by the process managers or supervisors responsible for the specific activities and by the process manager responsible for the subprocess that contains each specific activity.

The worksheet pictured in Figure 11.7 shows how we would record these measures. We have not listed manager titles or names on the worksheet, but that would probably be done on an actual worksheet.

Goals and measures worksheet			
Process measures: **Ergochair repair process**	**M1-I Internal measure:** Qulaity: First-time accuracy of repairs	**M1-E External measures** % yes on Q 19 "very satifactory % yes on Qq 20 "less than 4 h	
M-2 Subprocess: Trouble recorded	**Subprocess: Trouble tested**	**Subprocess: Repair dispatched**	**Subprocess: Trouble fixed**
#% of inacruate trouble descriptions % of first-time correct trouble tickets Time per trouble ticket	#% of testing errors Elapsed time in testing Time per test	#% of dispatch (address) errors Elapsed time from testing to dispatch # of incorrect dispatches	#% of "non-fixes" to accurately recorded problems Elapsed time from dispatch fix Time per fix
M-3 **Call taken activity**: #% of inaccurate or incomplete trouble descriptions. % of trouble tickets returned due to missing/inaccurate information Time/call. Time/ticket **File retrieved activity :** #% of wrong files leading to inaccurage trouble descriptions. % of returns due to wrong files. Time per retrieval % of "second" retrievals	[Incomplete]		

FIGURE 11.7

A process measures worksheet is used to record specific measures that will be monitored.

The Project Management Institute's Approach

If you would like to examine an approach that is very similar to the approach we have just described, you might consider examining the fifth edition of *A Guide to the Project Management Body of Knowledge* (the BMBOK Guide). The Project Management Institute (PMI) is a nonprofit consortium of people interested in the management and execution of projects. When you think about it, in most organizations large projects are often process redesign projects. Consider Boeing's division that develops C-17 airplanes. Each plane is a huge undertaking and is managed as an independent project. Thus, in effect, the manufacture of each C-17 airplane is both an instance of a business process and an individual project. We know some consulting groups that treat business process redesign methodologies as business project methodologies, and vice versa. Thus it makes sense that the PMI consortium, when it developed its approach to project management, created a model that is very similar to the one that a business process analyst might use.

Figure 11.8 pictures a process diagram of the generic model that PMI recommends. In effect, they suggest that a project manager undertakes five major processes. They proceed to subdivide those processes into subprocesses, which we picture in Figure 11.9. The PMI's PMBOK is a 550-page manual that spells out what kinds of knowledge and skills are required of a manager who seeks to undertake each of the various tasks listed in Figure 11.9.

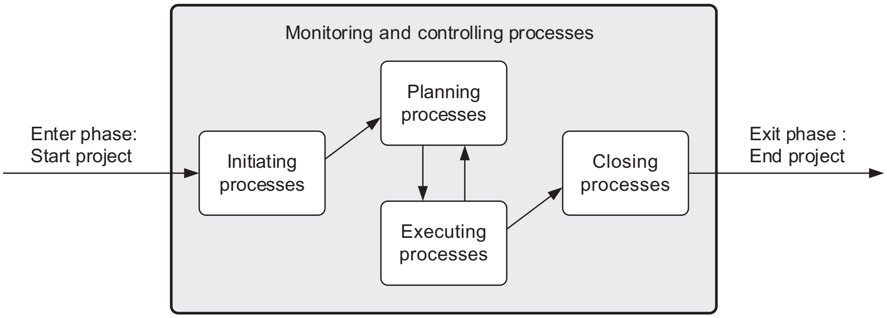


FIGURE 11.8

PMI model of the processes undertaken by a project manager.

Evaluating the Performance of the Process Manager

We discussed the evaluation of process manager performance briefly in Chapter 6. At this point suffice it to say that a process manager ought to be held responsible for achieving the following: (1) the output specified directly or indirectly with a real customer or with a downstream "customer" process; and (2) process improvements that over time render the process more efficient and effective. The first ought to be expected and mandatory. The second should be negotiated between the process manager and his or her boss. In addition, as we have already suggested, the same manager may report to a functional or unit manager and may be responsible for implementing functional goals and policies and for achieving agreed-upon measures required by the functional manager.

Figure 11.10 suggests some of the functional and process measures that might be used to evaluate the performance of a manager who is operating as both a functional and a process manager.

Continuous Measurement and Improvement

If an organization establishes process measures that extend from the process to the activity and if managers continuously check these measures and take actions when there are deviations, then process improvement becomes a part of every manager's job. In effect, measures determine how the activity should be performed. Higher level measures determine that the outputs of the activities are resulting in the desired task, subprocess, or process outcomes. If any outputs deviate the appropriate managers should take action.

Any given activity may fail to produce adequate outputs for many different reasons. Some failures will be the result of a failure in process flow. The work assigned to the activity is not appropriate or properly understood. But a flawed activity also represents a management failure. Managers are responsible for ensuring that

	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring & Controlling Process Group	Closing Process Group
4. Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor & Control Proj. Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
5. Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
6. Project Time Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
7. Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
Cont.					

FIGURE 11.9

PMI knowledge map of the tasks required in project management.

From PMBOK, 5th Ed.

Department or function	Typical departmental measures	Typical process measures
Sales department	• Cost of sales • Revenue ($)	• Timely and accurate submission of orders • Timely and accurate entry of new orders • Cost of processing orders
Production department	• Cost of inventory • Cost of labor • Cost of materials • Cost of shipping	• Timely order scheduling • Timely and accurate production of orders • Timely shipment of orders • Cost of unit production and shipping costs
Finance department	• Percent of bad debt • Mean labor budget	• Timely and accurate invoice preparation • Timely and accurate credit checks for new accounts • Cost of processing an invoice
External organizational measures	• Gross revenue • Cost of sales • Growth of customer base • Price of stock	• Percent of on-time delivery • Percent of rejects • Customer satisfaction as measured on survey or index

FIGURE 11.10

Comparison of some functional and process measures.

the people assigned to the activity understand what they are to do and have the resources to do it. And they are responsible for checking to see that the activity is done correctly, and that corrective feedback is provided if the activity is not performed correctly.

Any process redesign team that is proposing a major change in the way things are done had better be sure it plans for changes in management. If a specific supervisor is to manage a given activity for new outcomes the new outcomes need to be clearly specified. Moreover, the changes in the supervisor's job need to be incorporated in the job description of the supervisor's manager and so on right up the management hierarchy. If this is done during the redesign of the project, then everyone will know what to monitor, who is responsible for what outcomes, and when the new process is implemented. It may sound like a lot of work, but the alternative is to work hard on revising a process and then watch as it fails during implementation, when employees stick with previous tasks and managers do not spring into action to correct activities to ensure that they conform with the goals of the new process.

Management Redesign at Chevron

A nice example of what management alignment can do is illustrated by a redesign effort undertaken by Chevron in 1995. At that time Chevron was producing one million barrels of oil a day through six different refineries. The company was divided into three major functional units: refining, marketing, and supply and distribution.

The company decided it needed to improve its supply chain system to better integrate its internal processes. According to Peter McCrea, a Chevron VP:

> *We recognized that our system for planning and managing the supply chain, from crude acquisition to product distribution, was not working as well as it should. We had been working on this for a long time and were not making much progress. We decided we needed to take a holistic look at the entire supply chain.*

The company called in consultants from Rummler-Brache and asked them for help. The consultants in turn proceeded through the steps involved in process redesign, establishing a redesign team and an overview of the existing process. Beyond that, however, rather than focus on redesigning the sequence of activities that made up the process the team focused on how the process was currently measured and managed. They scrapped the old corporate operating plan and created a new plan based on linking corporate goals with process measures. Then they tasked managers with the responsibility for controlling activities based on these measures. A senior manager was assigned the responsibility for the entire supply chain, and each manager who was responsible for a subprocess became part of his or her team.

In a report in 1996 Chevron identified savings of some $50 million and attributed a significant portion of those savings to "doing our work a different way, with common plans and measures."

We cite this example to stress two things. A good process redesign, without an accompanying management and measurement plan, often fails to get implemented. If it is implemented it often fails to get the desired results. A good process redesign, accompanied by a good management and measurement plan, is much more likely to be implemented and successful. And, in some cases an existing process can be significantly improved just by implementing a management and measurement plan that ensures that the existing process works as it is intended to work.

In an ideal world one round of process redesign would result in a nearly perfect process and appropriate goals and measures. Thereafter, managers would simply fine-tune the process by studying outputs and taking corrective action whenever necessary. In reality, of course, one round of process redesign improves the process, but leaves some problems that still need to be changed. Moreover, as time passes and employees change new techniques are introduced, or as customer expectations increase processes need to be further refined.

In many cases process improvement is best undertaken by a group of employees working with the manager to refine the process. In the next chapter we will consider one of the more popular ways of handling more elaborate process improvement efforts.

Notes and References

The analysis of process management is primarily derived from the work of Geary Rummler. The basic concepts were introduced in *Improving Performance*, but have been considerably elaborated in recent lectures and workshops.

The latest book by Geary Rummler on his approach is:

Rummler, Geary A., Alan J. Ramias, and Cherie L. Wilkins, *Rediscovering Value: Leading the 3-D Enterprise to Sustainable Success*, Jossey-Bass, 2011.

Other business process theorists have also focused on improving the management of processes. Two of the best are:

Champy, James, *Reengineering Management*, HarperBusiness, 1995. As with the original reengineering book this is more about why you should do it than how to do it.

Hammer, Michael, *Beyond Reengineering: How the Process-centered Organization Is Changing Our Work and Our Lives*, HarperBusiness, 1997. Similar to the Champy book. Lots of inspiring stories.

In the mid-1970s I worked briefly for Louis A. Allen, a then-popular management consultant. As far as I know, his books are no longer in print, but he introduced me to the idea that managers must plan, organize, lead, and control. I have used some of his ideas, but changed "lead" to "communicate."

Information on the Chevron process management improvement effort is documented in a white paper: "Strategic Planning Helps Chevron's E&P Optimize Its Assets," which is available at http://www.pritchettnet.com/COmp/PI/CaseStudies/chevroncase.htm. See also Jim Boots' book, *BPM Boots on the Ground* (Meghan-Kiffer Press, 2012), which reports on Boots' time as the head of BPM at Chevron.

Hayler, Rowland, and Michael Nichols, *What Is Six Sigma Process Management*, McGraw-Hill, 2005. A good book on the role of management in Six Sigma.

Managing to Learn by John Shook (Lean Enterprise Institute, 2008) provides an excellent introduction to how Lean approaches the management of specific processes and empowers employees.

Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK Guide)* (5th ed.), PMI, 2013.

CHAPTER

Incremental improvement with Lean and Six Sigma 12

In the last chapter we saw how managers should be responsible for planning and controlling the business processes they manage. In a sense, planning, organizing, monitoring, and maintaining processes and activities is the everyday job of managers. Redesign projects, which have received most of our attention so far, are the exception, not the rule. At most times, in most situations, companies will want to focus on improving existing processes. In some cases companies will organize process improvement teams. In other circumstances the day-to-day process manager can organize a process improvement effort. Continuous process improvement occurs at organizations whose process managers or process teams routinely monitor their own processes and launch their own process improvement projects.

Many companies that aim at continuous process improvement use Lean, Six Sigma, or a combination of the two. In a narrow sense both Lean and Six Sigma are methods for process change, and are strongly associated with the process improvement method we will discuss in this chapter. In a broader sense Lean is a name for a subset of the ideas derived from the Toyota Production System (TPS), and Six Sigma is a movement that aims to make all employees aware of the value of process improvement and provides the organizational structure to support a continuous improvement effort. We can hardly consider all the aspects of either Lean or Six Sigma in a single chapter, and will focus primarily on describing how a manager and a team of employees might use Lean or Six Sigma to incrementally improve a process.

Six Sigma

At about the same time that Henry Ford created his moving production line and revolutionized auto production other people were exploring techniques that would let other companies improve their operations. An early practitioner who got much attention was Frederick Taylor, who is usually considered the father of operations research. Taylor published his classic book *Principles of Scientific Management* in 1911. He was obsessed with measuring every step in every process and then experimenting with variations until he found the fastest way to perform a process. Since Taylor, most large companies have employed engineers who have focused on improving operations. In a similar way, some individuals have specialized in catching defects by inspecting the output of processes. The latter is usually referred to as *quality assurance* or *quality control*.

Business Process Change. https://doi.org/10.1016/B978-0-12-815847-0.00012-1

Table 12.1 US and Japanese auto manufacturing

	GM Framingham Plant	Toyota Takaoka Plant
Gross assembly hours (per car)	40.7	18.0
Adjusted assembly hours (per car)	31	16
Assembly defects (per 100 cars)	130	45
Assembly space used (m^2 per car)	8.1	4.8
Inventory of parts maintained (average)	2 weeks	2 h

IMVP, International Motor Vehicle Program.
From IMVP World Assembly Plant Survey (1986).

The quality control movement got a huge boost in the 1980s after an oil embargo prompted US consumers to begin to buy more fuel-efficient Japanese cars. US consumers quickly discovered that Japanese cars were not only more fuel efficient, but were less expensive and better made than their American counterparts. There were fewer defects and problems, and the cars lasted longer.

Table 12.1 provides an overview of the problem that faced US automakers when they began to examine the differences between US and Japanese manufacturing. Clearly, the Japanese companies were building cars faster (and thus cheaper) and better than their US rivals.

Ironically, as US auto companies began to study what Japanese auto companies were doing they found that the Japanese companies attributed much of their success to an American quality control guru, Edward Deming. (In Japan the highest prize awarded for industrial excellence is the Deming prize.) Deming had been sent to Japan by the US government in the aftermath of World War II and had worked with Japanese firms to improve their processes.

Deming went beyond US practice and worked with Japanese companies to embed quality control programs into the fabric of Japanese production lines. US companies traditionally measured the quality of outputs by sampling the products that came off the end of the production line. Deming convinced the Japanese to go beyond that and measure quality at each step of the process. Japanese parts' suppliers, for example, learned to coordinate their schedules with manufacturing schedules and to only deliver new parts as they were needed, significantly reducing inventory storage times. This technique and others led to improvements that eventually led to a whole new approach to mass production, often called *lean manufacturing*.

In the late 1980s US companies struggled to become as efficient and effective as the best Japanese producers. Quality control methods became popular in the United States. Over the years companies have experimented with *statistical process control*, *total quality management*, and *just-in-time manufacturing*. Each of these quality control initiatives contributed to efficiency and better output as long as the managers of the company were willing to work at it.

Six Sigma is the latest in this series of quality control methods to sweep US companies. The Six Sigma approach was created at Motorola in the late 1980s. It was popularized by Mikel Harry, whose work caught the attention of Motorola CEO Bob Galvin. Galvin in turn spread the Six Sigma approach throughout Motorola, applying it to a wide variety of different processes. Somewhere along the line Six Sigma became much more than a process control technique and evolved into a systematic approach to process improvement.

In the early 1990s companies like Allied Signal and Texas Instruments adopted the Six Sigma approach in their organizations. Then, in 1995 Jack Welch, the CEO of GE, decided to use Six Sigma at GE. Welch announced that "Six Sigma is the most important initiative GE has ever undertaken… it is part of the genetic code of our future leadership." More importantly, Welch decreed that henceforth 40% of each business leader's bonus was going to be determined by his or her success in implementing Six Sigma. Welch's popularity with the business press and his dynamic style guaranteed that Six Sigma would become one of the hot management techniques of the late 1990s.

Six Sigma originated as a set of statistical techniques that managers could use to measure process performance. By using the techniques a manager could then make changes in the process to see if it improved the process. Once the process was as efficient as they could get it managers then used statistical techniques to maintain the process. As Six Sigma became popular in the late 1990s it was extended to improve processes far removed from manufacturing. In keeping with the then-current interest in business process reengineering, Six Sigma consultants evolved their method to incorporate techniques and definitions from process reengineering consultants.

Today, for example, most Six Sigma books begin by defining three types of process change efforts: (1) process management, (2) process improvement, and (3) process redesign.

Process management, in the world of Six Sigma, means developing an overview of the company's processes, linking it with corporate strategy, and using it to prioritize process interventions. In other words, what Six Sigma folks would call *process management*, we would call *process architecture*. We prefer to use *process management* more broadly to include how managers' jobs are organized and how managers take responsibility for the processes they oversee, as well as various implementation technologies.

Process improvement, as Six Sigma proponents use it, refers to a set of techniques used to incrementally improve and maintain process quality. We use the term the same way, except that we would include some nonstatistical techniques as well. More importantly, we would make a distinction between *continuous process improvement*, which every manager ought to do as a daily part of his or her job, and *process improvement projects*, which are undertaken to significantly improve the quality of a process in a short period.

Six Sigma practitioners use the term *process redesign* to refer to major changes in a process. In other words, they use process redesign the same way we do.

After defining the three types of process change, as we just described them, every Six Sigma book we have ever looked at proceeds to focus almost all the remaining chapters on process improvement, how to organize project teams, how to measure process outcomes, and the statistical techniques used to analyze outcomes.

None of the Six Sigma books we have seen provide nearly enough information on how to analyze processes. Most simply suggest that the project team should develop a high-level overview of the process (which we will turn to in a moment) and then suggest the use of "workflow diagrams" if more detail is needed. What this underlines, in our opinion, is that Six Sigma works best with well-understood, currently implemented processes. If extensive analysis of a process is required we suggest that managers look at books outside the Six Sigma tradition to find useful approaches.

What Six Sigma is good at is describing how to think about measuring process and activity outcomes, and about how to use statistical techniques to analyze the outcomes and decide on corrective action. We believe that every process manager should study one or two Six Sigma books and use his or her insights to help define measures for the processes he or she manages. (We have listed several of the best in the Notes and References at the end of this chapter.) Six Sigma techniques are just as useful when practiced by a manager who is responsible for a process or activity as they are when they are used by a project team that is focused on improving a process or activity. A team approach, however, is often superior in situations in which the manager wants to engage and motivate an entire group of employees to improve a process.

In the remainder of this chapter we will discuss Six Sigma as it is usually presented by Six Sigma consultants—as a method that can be used by project teams to improve a process. Before turning to projects, however, we will take a moment to define the statistical ideas that lie behind the name "Six Sigma."

The Six Sigma Concept

Quality control engineers have always used several statistical tools to analyze processes. Six Sigma is a name derived from concepts associated with a standard bell-shaped curve. Almost anything varies if you measure with enough precision. The specification might call for a car door to be 1 m (100 cm) high. By using a standard meter stick all the doors might seem exactly 1 m high. By using a laser measuring device that is more exact, however, you might find that some doors are 99.70 cm high, whereas others are 100.30 cm high. They average 100.00 cm, but each door varies a little.

Statisticians describe patterns of variations with a bell-shaped or Gaussian curve. (Carl Frederick Gauss was the mathematician who first worked out the mathematics of variation in the early 19th century.) We have pictured a bell-shaped curve in Figure 12.1.

If the items being measured vary in a continuous manner one finds that variation frequently follows the pattern described by the bell-shaped curve: 68.26% of the variation falls within two standard deviations. In statistics the Greek letter sigma (σ) is used to denote one standard deviation; 99.73% of all deviations fall within six standard deviations.

In Figure 12.1 we show three sigmas to the right of the mean. Imagine that we subdivided the 0.13% of the curve out on the right and inserted three more sigmas.

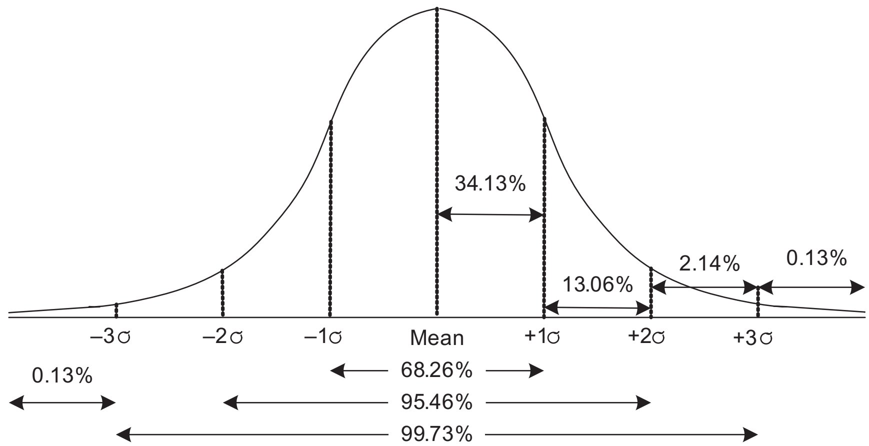


FIGURE 12.1

Properties of a standard bell-shaped curve.

In other words, we would have six sigmas to the right of the mean, and some small amount beyond that. In fact, we would cover 99.99966% of the deviation and only exclude 3.4 instances in a million. Six Sigma projects rely on formulas and tables to determine sigmas. The only point you should remember is that we want to define what we mean by a defect, and then create a process that is so consistent that only 3.4 defects will occur in the course of one million instances of the process.

Returning to our doors and applying our knowledge of standard distributions, you can expect that if the shortest door was 99.70 cm and the tallest door was 100.30 cm most of the variations in the doors would fall between 99.70 and 100.30. They might not do this, however, for various reasons. How they vary from a standard distribution would tell a Six Sigma practitioner something about the process. For example, if instead of one curve there were two with two different means it would suggest that two independent variables were affecting the output. In any case the chance that a door was more than six standard deviations to the right of the mean, using a process curve, is 3.4 in a million. The goal is to reduce clearly unacceptable output to less than 3.4 failures in a million.

At first, many managers are skeptical of the goal. It seems more appropriate for large manufacturing processes than for more complex processes that are done less frequently. Once one considers a large enough sample, however, Six Sigma is not always that demanding. How many plane crashes per million flights would you accept? How many bank checks per million would you want deducted from the wrong account? How many incorrect surgical operations would you tolerate per week? In all these cases, in a week, a month, or a year, there are millions of events. In most cases you would rather not have even 3.4 failures per million. The goal is rigorous, but in many situations it is the minimum that customers should have to expect.

Let us consider another problem. Suppose that the hypothetical restaurant, San Francisco (SF) Seafood, decided to undertake a Six Sigma project and decided to focus on the delivery of meals to diners. The team gathered data by asking customers about how quickly they liked to receive their meals and what they considered an unacceptable wait. The data suggested that half the customers would prefer their meals in 15 min or less. All the customers agreed, however, that meals should arrive within 30 min. If a meal was delivered after 30 min all the customers were unhappy. By using these data the SF Seafood Six Sigma team prepared the bell-shaped curve shown in Figure 12.2, assuming that they would shoot for an average time of 15 min and not tolerate anything over 30 min.

In this case Six Sigma refers to variation of a specific process measure—time from when an order is taken to when it is delivered. The goal the team adopted was to deliver all meals as close to 15 min as possible. They were willing to allow some variation around 15 min, but wanted to ensure that all meals were delivered in less than 30 min. In other words, they wanted to achieve Six Sigma and ensure that all meals, except 3.4 in a million, would be delivered in 30 min or less.

The goal of most Six Sigma projects is to reduce deviation from the mean. Some projects focus on setting a more rigorous mean. Assume that we decided that we wanted to deliver half of all meals within 10 min and all meals within 20 min or less. In this case we would set 10 min as our target for the mean and 20 min at six standard deviations (sigmas) to the right of the mean. The bell-shaped curve would be even narrower than the one shown in Figure 12.2, and deviation from the mean would be less. It would require a better controlled, more efficient process to ensure that most meals arrive in 10 min and no meal ever arrives in more than 20 min.

So, Six Sigma refers to improving processes until they are so consistent that they only fail in 3.4 cases in one million. It also refers to the idea that we establish and measure process goals and a mean and then work to reduce deviation

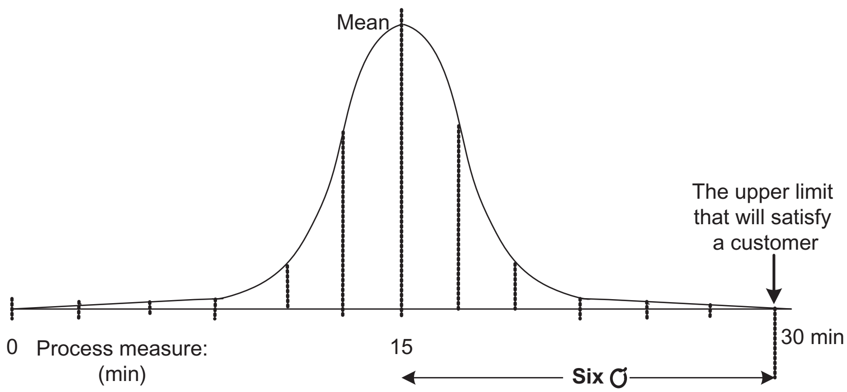


FIGURE 12.2

Model of a process showing how often dinners are delivered in 15 min.

from the mean. In other words, we work to make the process more consistent, and we use statistical tools to test whether we are succeeding.

The Six Sigma Approach to Process Improvement

In an ideal company every process would already be mapped and measured by those responsible for managing the process. In reality, of course, most processes are not mapped or well understood by those who manage them. Moreover, if they are measured, then functional measures are usually the norm. In some companies managers could read one of the popular Six Sigma books and then implement the ideas by themselves. In most cases, however, it works best if the manager involves the workers in the process of analysis and shares with them the satisfaction of achieving the goals. Six Sigma practitioners always talk in terms of process improvement projects and focus on teams, not on individual managerial efforts.

Many Six Sigma projects begin by helping a management team develop a process architecture. If an architecture already exists, then the Six Sigma practitioner focuses on helping managers identify projects that will benefit most from a process improvement effort.

Process improvement projects based on the Six Sigma method are usually short and typically range from 1 to 6 months. In many companies that have adopted the Six Sigma approach the executive committee chooses two or three processes for improvement every 6 months. Some Six Sigma books give the impression that Six Sigma projects tackle value chains or major business processes. They reinforce this impression by discussing processes at small companies or relatively simple business processes. In reality, most Six Sigma projects focus on a subprocess or subsubprocess. Many focus on what we would regard as a single activity.

To clarify this, let's consider that most Six Sigma projects focus on monitoring two or three measures. If one were to try to monitor an auto production line or an insurance company sales system with two to three measures one would not get the kind of data that Six Sigma projects need, to identify causes and to check that changes are getting the desired results. Put another way, it would take at least a month just to analyze the subprocesses in a large business process like an auto production line or a large insurance sales process.

Measuring an entire value chain or business process with two or three measures is a reasonable thing for a process manager to do. Unfortunately, if the measures suggest that sales are decreasing or that production is down 5% they do not usually suggest the cause. In most cases the process manager will need to examine more specific measures to determine which subprocess or subsubprocess is responsible for the problem. In other words, measures on large processes usually only provide early-warning signals that a more detailed study needs to be initiated.

In most cases Six Sigma projects are not launched to improve large-scale business processes; they are launched to improve subprocesses or activities. More importantly, however, Six Sigma always stresses that measures at any level should be tied back to higher level processes and eventually to strategic goals.

Six Sigma Teams

Six Sigma projects are usually chosen by a steering committee that oversees all Six Sigma efforts or by the process sponsor or team sponsor. Every project needs a team sponsor or champion. This individual is usually the process sponsor or a member of the steering committee that selected the project in the first place.

The team is headed by either an individual devoted to managing Six Sigma projects or a manager associated with the project to be improved. In Six Sigma jargon, if the leader is especially knowledgeable in Six Sigma projects he or she is called a *black belt*. If the leader is a manager who has full-time responsibilities elsewhere and is slightly less qualified he or she is referred to as a *green belt*. The team is often assigned an internal or external consultant who is a specialist in Six Sigma, and especially skilled in the use of the statistical tools that Six Sigma depends on. This consultant is usually called a *master black belt*. (These designations are usually the result of a combination of experience and passing examinations.)

The team members are chosen because they have expertise in the actual process that is to be improved. If the process is really an activity or small process the team members are employees who perform the activities or steps involved in the process.

Some Six Sigma practitioners spend much time talking about how good teams are formed and the processes the teams should employ—voting and so forth. We will not go into it here. Suffice it to say that the team leader should know something about team building and team processes, and should apply that knowledge to create an effective team.

The teams meet for 2–3 h at a time. Initially, they meet two to three times a week, but as they shift to data collection they meet less frequently.

Phases in a Six Sigma Improvement Project

Most Six Sigma projects are organized around a process improvement approach that is referred to as the *DMAIC process*. DMAIC stands for:

- *Define* customer requirements for the process or service.
- *Measure* existing performance and compare with customer requirements.
- *Analyze* existing process.
- *Improve* the process design and implement it.
- *Control* the results and maintain the new performance.

Figure 12.3 provides an overview of these key steps or phases and the activities that occur in each step. It also suggests the time required for each step. Some overlap between phases usually occurs.

Obviously, the sequence of steps and the times will vary widely, depending on the size and the complexity of the project. In the best case one will define the goal, create measures, measure, identify some obvious improvements, implement process changes, measure again, and be done. In the worst case you will identify multiple goals, create measures, measure, identify multiple possible improvements, try some and not get

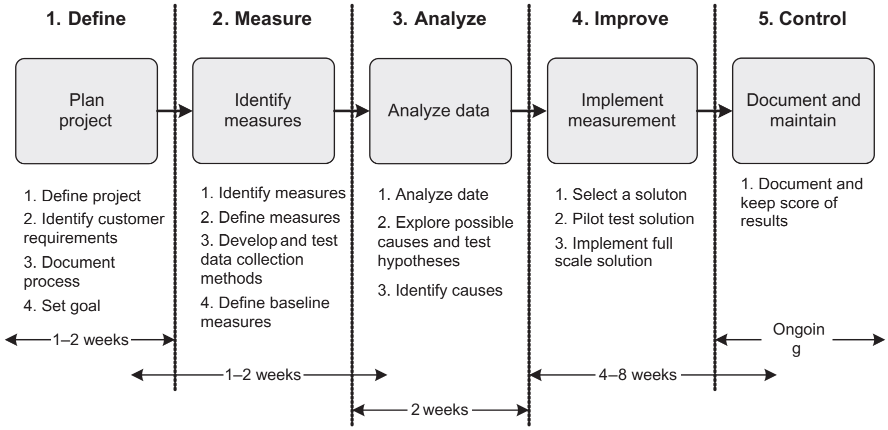


FIGURE 12.3

Overview of a Six Sigma project.

adequate results, try again, decide you need different measures, try again, analyze, try still another process improvement, measure some more, and finally achieve your revised goal. In other words, simple projects run straight through, as previously shown. Complex projects recycle through the steps multiple times until they achieve results.

One key to accomplishing Six Sigma projects quickly is having an experienced black belt (full-time project leader) or master black belt (champion). Some elements of each project, like the steps in a process or the customers, are unique to the specific process and must be debated and analyzed by the project team. Other elements, like when to apply what measures and how to set up certain types of measures, can be accomplished quickly by someone experienced in the Six Sigma process and armed with an appropriate software tool that they know how to use. An experienced consultant can help keep a team moving and get them through other rough spots that would otherwise delay the project for extra weeks.

Not all projects achieve Six Sigma. As most Six Sigma practitioners explain, Six Sigma is a goal. The ultimate idea is to improve the process and to reduce variation in the process as much as possible. It is the attitude and not a specific target that is most important.

We will consider each phase of a Six Sigma project in more detail.

Define

In the first phase a draft charter is usually provided by the project sponsor or team champion. The charter is a clear statement of what the team should accomplish. It should include a brief description of the process to be improved and the business case for improving it. It should also include some milestones and define the roles and responsibilities of the team members. This task is easier if the steering committee has defined a good process architecture and has already defined the scope and goals of the project. If the steering committee has not done this, then the Six Sigma team must make some guesses, explore the problem a bit, and then return to the charter and refine it toward the end of the *define* phase.

One key to a good charter is a clear understanding of the process to be improved. Like any good contract the charter should specify who will do what, and when. Dates, costs, and a clear statement of the expected results are all important. The team should not allow itself, however, to get pushed into trying to predict the exact changes they will make or exactly how long it will take to reach Six Sigma. Instead, the charter should focus on defining the process to be improved and some initial measures that can be used to judge if the team succeeds.

Six Sigma teams usually put much emphasis on who the customers are and what will satisfy them. The emphasis on the customer that occurs throughout Six Sigma is one of its more attractive features. The customer referred to, of course, is the person or group that receives the product or service produced by the process the team is focusing on. Most groups within organizations produce products for other internal groups. Thus, for example, the customer of inventory is manufacturing. The customer of new product design is marketing and product engineering, and so forth. Still, it is always good for a project team to begin by focusing on the fact that they produce products or services for some person or group that functions as a customer that they must satisfy. And even when a team focuses on an internal customer it is always good to define, if only informally, how that customer is linked to some external customer.

The Six Sigma approach to process definition is summed up in the acronym SIPOC, which emphasizes Supplier, Input, Process, Output, and Customer. Figure 12.4 pictures a SIPOC diagram of SF Seafood's *food service* process. SF Seafood only serves dinners, so all data are based on evening dining and not on lunches. The immediate output of the *food service* process that we are focusing on was a meal on the table. In fact, the team was working on a broader definition of output, customer satisfaction, and a meal, and its timely delivery is only one part of that overall output. We will consider output in more detail in a moment.

Figure 12.4 shows the standard SIPOC approach that most Six Sigma practitioners use. As an overview there's nothing wrong with it, although it usually works a little better when you are describing a concrete process and is a little harder to apply when you are describing a service process. As you recall from our earlier discussion of SF Seafood the company considers the dining area as one value chain, and the kitchen as another. We are going to focus on satisfying customers who have meals at SF Seafood; hence, in the SIPOC diagram shown we listed four major steps in the food service process. We also listed two other steps that link the waiters to the kitchen and vice versa.

In this case we are focusing on both food and service processes. We listed two inputs to the basic process we are focused on—the laundry provides jackets for the waiters and table linen, and the vendors provide the raw food used in the kitchen. We could easily list more suppliers and inputs.

In keeping with Six Sigma policy, we have divided the process—food and service—into three to seven subprocesses or steps. Luckily, there are no complex

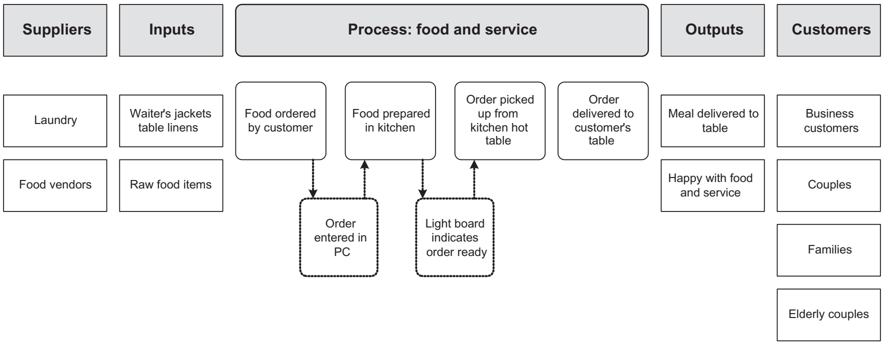


FIGURE 12.4

SF Seafood's food service process.

branches. (If we had considered orders and included the delivery of both food and drinks, which come from two different processes at SF Seafood, we would have had a harder time developing a neat overview.) As it is, the basic service process does not emphasize food preparation in the kitchen, which is surely going to be a factor in customer satisfaction.

To simplify this case, let's assume that the *food preparation* process has already been the focus of a different Six Sigma project. The team determined that food was needed quickly and needed to be tasty and hot. They found that they could deliver meals in 9 min from the time they received the order on the kitchen PC. Six Sigma work resulted in variations of between 6 and 12 min. (Yes, they preprepare meals and sometimes use a microwave to heat them.) Thus we know the characteristics for the Food Prepared in Kitchen activity and can focus on obtaining and delivering the order. It also means that we do not really need to worry about the raw food items delivered to the kitchen, but only about inputs to the *food delivery* process.

The specific output in our example is a meal delivered to the table. That output, however, is part of a broader goal the team is working toward—customers who are satisfied with their meals and meal service. We put most of our effort into identifying customers (or market segments) and arrived at four groups of customers who might have different ideas of what makes a satisfying meal. Customers with kids, our later research showed, prefer food much faster. Couples and elderly customers are willing to wait longer. Business people are in between—although they vary a bit—presumably depending on the occasion.

After the team analyzed the process and customers they turned their attention to the kinds of things about a dinner meal that might satisfy customers. In a sense this involves asking what kinds of needs customers have. Teams usually list potential requirements on a chart called a CTQ (critical-to-quality) tree, like the one shown in Figure 12.5. One starts on the left with the overall output. Then one hypothesizes what might result in the output. If appropriate one can move on to a third or fourth level, hypothesizing more and more specific or discretely measured requirements.

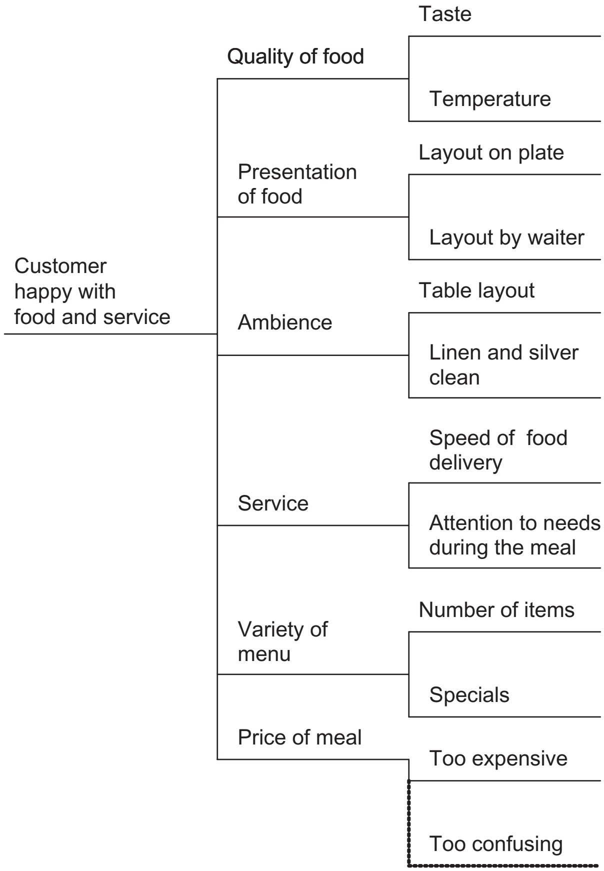


FIGURE 12.5

Critical-to-quality tree for the SF Seafood meal satisfaction project.

The initial list prepared by the SF Seafood Dining Six Sigma team is shown in Figure 12.5. Once the team has arrived at a list like this it needs to figure out how to determine the role each of these possible requirements actually plays in customer satisfaction.

One always needs to test and be prepared to revise. We added the last item (Price of Meal—Too Confusing) to illustrate something the team did not think of, but which showed up in interviews with elderly couples. It seems that SF Seafood priced all items independently, and some elderly couples were confused about the total cost of the meal they were ordering when they had both a main item and a side order. (SF Seafood decided to change its policy and price specials, which were popular with elderly diners, as single-price meals.) The point, however, is that the team begins with a list and then gathers information to confirm or change the list.

Most Six Sigma books provide detailed discussions of the ways one can gather information from customers. We will not go into them here, but suggest that anyone interested in measuring processes consult one of the Six Sigma books for such details. In brief, most suggest surveys, one-on-one interviews, and focus groups. Other techniques include recording and studying customer complaints, or having team members act as customers and record their impressions. Restaurant websites often provide a mechanism that allows customers to evaluate restaurants, and SF Seafood found local restaurant websites a good source of complaints and occasional praise.

Obviously, the team will need to gather data about the requirements of all the different groups or segments of customers. Different types of data-gathering approaches may work better with different groups. For example, SF Seafood found that elderly customers were happy to sit and talk with a *maître d'* about what they liked and disliked about their meals. Business people and families, on the other hand, did not want to sit and talk, although they would take survey forms and some of them would then mail them in.

Based on data gathered the team usually identifies the most important requirements of customer satisfaction. Six Sigma practitioners put much emphasis on Pareto analysis. Most of us know this mathematical concept as the 80/20 rule. As a generalization, 80% of customer satisfaction can be accounted for by 20% of the possible requirements. In other words, you can usually narrow the list of requirements that will satisfy customers down to two or three items. They may vary by customer segment, but for each customer segment it is usually sufficient to track two or three items.

For business customers, taste, temperature, speed of delivery, and attentiveness during the meal were considerably more important than the other items on the CTQ requirements tree. On the other hand, for elderly customers, taste, temperature, and specials were most important.

The team was able to ignore taste, because that was under the control of the kitchen, but decided to gather data and pass them to the chef, while focusing on improving the dining room service.

The team ends the first phase with a refined charter—a clear idea of the scope of the project, the customers and their most salient requirements, and a set of milestones.

Measure

During the second phase of the project the team develops measures that will let them know how well each key requirement is being satisfied. Most Six Sigma books spend a bit of time explaining the concepts underlying statistics and measurement, and provide explanations of formulas that are appropriate for handling the different types of data one might collect. Because different types of data result in different types of curves it is important that someone understands these things and thus knows how to analyze the data and evaluate the results. In most cases this expertise is provided by a master black belt or consultant. Most Six Sigma projects rely on software tools to actually analyze the data. (MiniTab, for example, is a popular statistics analysis tool that is widely used to crunch the data and generate curves.) We are not going to go into measurement theory or discuss statistical formulas. If you need this kind of information you will want to read a book that covers it in more detail than we can here. Once again, Six Sigma books that do exactly that are listed in the Notes and References at the end of this chapter.

One Six Sigma author, George Eckes, suggests three measurement principles:

- Measure only what is important to the customer.
- Only measure process outputs that you can improve.
- Do not measure an output for which you have no history of customer dissatisfaction.

Within these constraints every Six Sigma team must focus on determining how to measure process effectiveness and efficiency. There are basically three things one might measure:

- *Inputs.* One can check what was delivered by the supplier to ensure that problems do not lie with the inputs to the process. In the case of SF Seafood there are the linen tablecloths and waiter jackets. We assume that the chef is already checking the quality of the raw food items delivered by suppliers.
- *Process measures.* These measures typically include cost, cycle time, value, and labor.
- *Outputs or measures of customer satisfaction.* In the SF Seafood case we might stick with a survey form that we gave to customers when they left the restaurant. There might be some more dramatic form of output measure as well. Consider that some customers are reviewers or evaluators for magazines that assign ratings to restaurants. In France every upscale restaurant waits nervously each spring for the new *Michelin Red Guide* to be published so they can see how many stars they have been awarded. (A restaurant in France that moves from two to three stars—the highest Michelin gives—typically can double its prices and be ensured a full house every night! Thus, such a Michelin satisfaction rating can more than double a restaurant's annual income.)

In complex manufacturing processes the best output data are often generated by the receiving group, and the trick is to get them routed back to your group so you can use them. Our dining team, for example, is going to gather data on customers that were dissatisfied with the taste of their food, and then route that information back to the kitchen.

Another way to think about measures is to distinguish between process measures and outcome measures. You can use either, but it is usually best to start with output measures because that is what the customer is most concerned with.

If the process or activity measure is:	Then an outcome you might measure is:
• process with a specific goal	• strategic goals achieved
• quality of work in a specific activity	• level of customer satisfaction
• time a process takes	• on-time delivery
• adequacy of staffing	• time to answer telephone or produce unit
• adequate understanding of task	• nature and number of defects produced

In all cases it is ideal to tie the measure to customer satisfaction. This focuses everyone on the basic concept that you are not doing the work for its own sake, but to provide a product or service that will satisfy and even please a customer. Customers buy products, and they usually have options. If they are not satisfied, ultimately it makes no difference how the work was done. This is just as true if your customer is another process within your own organization as it is if the customer is someone outside the company. Many IT departments in large companies have learned this in recent years, as companies have outsourced IT functions, applications, or entire IT departments to obtain more satisfactory service at a better price. Increasingly, as companies move toward virtual processes and more elaborate outsourcing arrangements it will become clear to even support groups deep within the company that a process either provides value and satisfies customers, or the customers will end up seeking alternatives.

Some Six Sigma practitioners recommend distinguishing between output measures and service measures. In this sense "output" refers to features of the product or service you deliver, and "service" refers to more subjective things having to do with how the customer expects to be treated and what kinds of things please the customer. Getting the hamburger correctly assembled quickly is an output measure. Getting a smile with the hamburger, or having the waiter remember your name and use it, is a service measure. As a company, if you want to succeed you have to get output measures right. If you want to be really successful and have loyal customers, you have to get the service measures right as well.

Another way Six Sigma practitioners talk about this is in terms of categories created by Noriaki Kano, a leading Japanese quality control expert. Kano developed some measures that can be used to qualify data about customer satisfaction, which we will not go into here, often spoken of as *Kano analysis*. He divided customer requirements into three categories:

- *Basic requirements.* This is the minimum the customer expects. If he does not get this he will go away upset.
- *Satisfiers.* The additional output or service measures that please the customer. The more of these you get, the happier the customer will be.
- *Delighters.* These are things the customer does not expect. They are usually things the customer would never put on a survey form because he or she does not even know he or she should want these things. Having telephones available at each restaurant table, for example, might delight some business diners. Having the bus person whisk out an umbrella on a rainy day and accompany customers to their car is another.

If one is unclear it never hurts to meet with the customer and find out how he or she judges the products or services he or she receives from your process. Every department or functional unit has some internal criteria that it measures and seeks to meet. In some cases, however, departments end up maximizing goals that are not important to customers. Imagine a sales organization that places emphasis on closing many sales quickly. Ordinarily, it seems like a reasonable sales goal, but if manufacturing is struggling to come up to speed on a new product run, closing many sales quickly may only make for unhappy customers who do not receive their products in a timely manner. There is no science to choosing the right measure, but the trick is to choose one to three measures that really track quality, efficiency, and customer satisfaction in the most efficient manner. Too many measures waste time. Measures that are not clearly tied to customer satisfaction risk maximizing some aspect of a process that does not really produce results that are important to the customer.

Each measure must be carefully specified so everyone understands exactly how it is going to be determined. Thus, for SF Seafood, one measure will be the time it takes to receive a meal. In this case we would like to have someone determine the time when the waiter finished taking the order and then later determine when the food is placed on the table. Because SF Seafood uses a computer-based order system waiters enter each order into a computer that then routes food orders to the kitchen and drink orders to the bar. The orders are placed in a queue on the computer in the kitchen. Waiters can enter a request to expedite an order, and we will need to control for that in our measurements. When the kitchen has an order ready they enter a code and a light goes on a board that the waiters can see in the dining area. Obviously, it would be easy to track when a PC order is placed and when the kitchen enters a code to indicate that the order is waiting on the hot table. The time between the PC entry and the kitchen entry, however, will only tell us how long it takes the kitchen to prepare the meal (i.e., 9 ± 3 min). It will not tell us if the waiter went directly from the table to the PC, or went to another table before going to the PC to place the order.

Because the focus of the team's effort is the delivery itself they decide that they will have to assign an observer to record when orders are taken and delivered. This will need to be someone not otherwise involved in any dining activities to ensure that he or she has the time to watch several tables carefully and keep accurate records. Total delivery time is defined as the time between when the waiter takes the order and when he or she enters it into the computer, plus the time between when the kitchen indicates in their computer that the order is on the hot table and when the order is delivered to the table.

At the same time, the team created a new, simple survey form that they decided to hand out to all diners and requested that they complete it and return it by mail. The survey form was on a prepaid postcard.

Without going into the details about how the team classified the various types of measures, or the formulas used to summarize the data, suffice it to say that there are many techniques that an experienced practitioner can use to refine the data and provide insights.

The team arrived at a variety of conclusions after looking at the data. One was that half the customers preferred getting their meals in 15 min, and all resented having to wait longer than 30 min. This resulted in the bell-shaped curve we presented earlier (Figure 12.2). Because the team was not focusing on the cooking process as such they needed to factor out the 9 ± 3 min of food preparation time. That left 18–24 min that was controlled by the waiters. (In other words, we subtracted the 6–12 min of food preparation time from the 0–30 min and arrived at a new curve that reflected the time remaining between food preparation and actual delivery.) The new curve suggested that anything beyond 18 min was unacceptable.

If the meal was prepared in 6 min and the waiter took 18 min to submit and deliver the order the customer would get the meal in 24 min. If the meal took 12 min to prepare and the waiter took 18 min to submit and deliver the order the order would be delivered in 30 min. Theoretically, if the waiter knew the meal would be prepared in 6 min he or she could have up to 24 min to deliver the meal, but because the waiters never knew how long meal preparation would take they had to assume that each meal would take 12 min. If the kitchen Six Sigma team was able to improve their process so that they could guarantee a narrower variation, then the delivery process could gain more time. But, because the goal was to move toward a delivery time of approximately 15 min, this was really irrelevant.

Hence, the new bell curve for the waiters ran from 12 to 30 min, with a mean of 21 min. In other words, a waiter could use up to 18 min and always make the 30-min limit. The goal the team set, however, was to come as close to 9 min as possible. The data suggested that it took as long on average to place the order as to move it from the hot table to the customer. Thus a subsidiary goal was to place orders within 9 min, coming as close to 4.5 min as possible, and to deliver meals from the hot table to the customer within 9 min, coming as close to 4.5 min as possible.

The team proceeded to gather data on the time it took waiters to place and deliver orders. As the data began to accumulate they moved to the analysis phase to make sense of it.

Analyze

In many cases the team members have a good idea of the cause of the problems in the process they analyze. They gather data to establish baselines and then want to jump to implementing a solution. In some cases this is reasonable. The waiters in our example probably know what takes time and know how they could save some. In more complex cases, however, it is not so obvious.

Once you have some measurement data there are many ways to analyze what might be causing a problem. Some of them involve defining the process in more detail. Others involve applying statistical tools to the data.

Assuming you have developed a detailed process diagram you can establish measures for each activity on your diagram. It is also useful to consider how each activity adds value to the entire process. In essence, any given task can be classified into one of three categories:

1. The activity adds value that the customer, whether internal or the ultimate customer, is willing to pay for.
2. The activity is necessary to produce a value-added activity.
3. The activity does not add value.

You can always check with the customer to determine which activities add value. You normally would not ask the customer to consider the activities as such, but what they add to the final product or service. This consideration takes us back to the issue of how we choose measures. You could ask, for example, if the customer likes the flowers and the white jackets the bus people wear. If the customer tells you it is a matter of indifference how the bus people dress you might consider what the purchase and cleaning of the jackets add to the customer's bill and consider if it might be worth dropping that aspect of the service package.

It is usually easy to identify the activities that add features that customers can identify and value. Those that do not fall in that category are usually placed in Category 2. In fact, some activities do need to be done so that other Category 1 activities can be done. Each needs to be challenged, however. Often, processes that have been done for a while end up supporting activities that are no longer really required. In all surveys at SF Seafood the customers indicated that napkin rings were of no value to them. Clearly, the placing of napkins in rings when setting the table was an activity that could be eliminated. It took time, cost money, and did not add any value to the customer's dining experience.

Consider a company that installed an email system that allowed salespeople to report their results each day online. For some unknown reason the company had installed the email system, but never eliminated the requirement that the salespeople complete a Form 2B and submit it on the 30th of each month. In fact, Form 2B only provided information that the sales managers were already obtaining via the daily emails. Completing Form 2B was a value-reducing activity. Worse, sales managers continued to log the forms to ensure that each salesperson turned them in on time. It is always wise to consider eliminating activities that do not add value. Moreover, if an activity is value reducing one should check to be sure that no one is measuring that activity.

The analysis of waiter problems at SF Seafood seems straightforward. In fact, those familiar with a small lunchtime restaurant might be surprised that it takes as much time as it does at SF Seafood. It might seem obvious that if the waiter simply went straight to the PC after taking an order and entering it, it would only consume a minute at the most. Similarly, it might seem obvious if the waiter went to the hot table as soon as he or she saw a flashing light that delivery of the food could not take more than another minute. That would get the total delivery time under 3 min. Were there one waiter per table they could probably come close to that. Unfortunately, in SF Seafood each waiter is expected to cover from five to seven tables depending on the hour. Some waiters are scheduled to begin work when the restaurant opens and there are only a few customers. Then more are added as the numbers grow toward the maximum number between 7:30 and 9:30 in the evening. Equally importantly, waiters not only take orders they serve drinks and attend to customers who may want help choosing a wine or other drinks, coffee, or desserts. Moreover, as every waiter learns, if you always do only one task at a time you can never get everything done that needs doing. If you are already going to the kitchen to get one meal, getting two is better.

If you are already taking an order, taking orders from two tables, one after the other before placing either order, saves time.

One obvious way to analyze the process is to assign times to each of the tasks a waiter must do and multiply by the number of tables the waiter is trying to serve. It may be obvious that a waiter should avoid being overstretched by only serving four tables rather than five. Or, perhaps, a change that involves the bus people helping the waiters move meals from the hot table to customer tables may save time. If that's a possibility, then we would need to determine exactly what bus people do and what would remain undone if bus people began to do more to help waiters.

This is not the place to go into such details further. Imagine if we had included the kitchen in our analysis and needed to analyze all the steps that went into the preparation of a meal, and tried to decide if it would make a difference if the salad chef was more efficient, or if the oven was set 2° higher. Or, imagine we were analyzing a production line with hundreds of activities that needed to be coordinated, some of which could be rearranged. The larger and more complex the process the more problems we need to consider. In some cases statistical tools become an invaluable way of sorting out the seemingly overwhelming confusion about which activities are really making the most difference in the final outcome.

Six Sigma project managers usually recommend a systematic analysis process. You begin with a comprehensive look for possible causes. Then you examine the possible causes in more detail, gather data as appropriate, and apply statistical tools, such as regression analysis and scatter diagrams. In the most complex cases you are forced to design experiments and vary or control one or another aspect of the problem while gathering data. In the end you usually come back to the 80/20 rule. There may be many causes, but one or two causes (20%) usually account for 80% of the problem. Those are the causes that one initially focuses on to make the process more efficient.

Some Six Sigma practitioners talk about problem analysis as a three-stage process:

1. *Open.* Brainstorm to identify as many possible causes as possible.
2. *Narrow.* Use tools or vote to reduce the number of possible causes to a reasonable number.
3. *Close.* Design measures, gather data, and analyze them to determine which causes in fact cause most of the deviation from the mean.

One popular tool used by many Six Sigma teams when they are trying to identify all possible causes is a cause-effect or fishbone diagram. In effect, it is another kind of tree diagram that one examines to whatever depth is appropriate. We have illustrated a cause-effect diagram for the waiting task in Figure 12.6.

The cause-effect diagram in Figure 12.6 is hardly exhaustive, but it provides an idea of how one identifies a cause, defines it further, and yet further still if possible. The actual diagram for SF Seafood was much more complex than this. Also, there are some overlapping categories. For example, families with more than two kids are likely to also want to rearrange tables. Moreover, these same tables are the ones that could really benefit from extra help from a bus person.

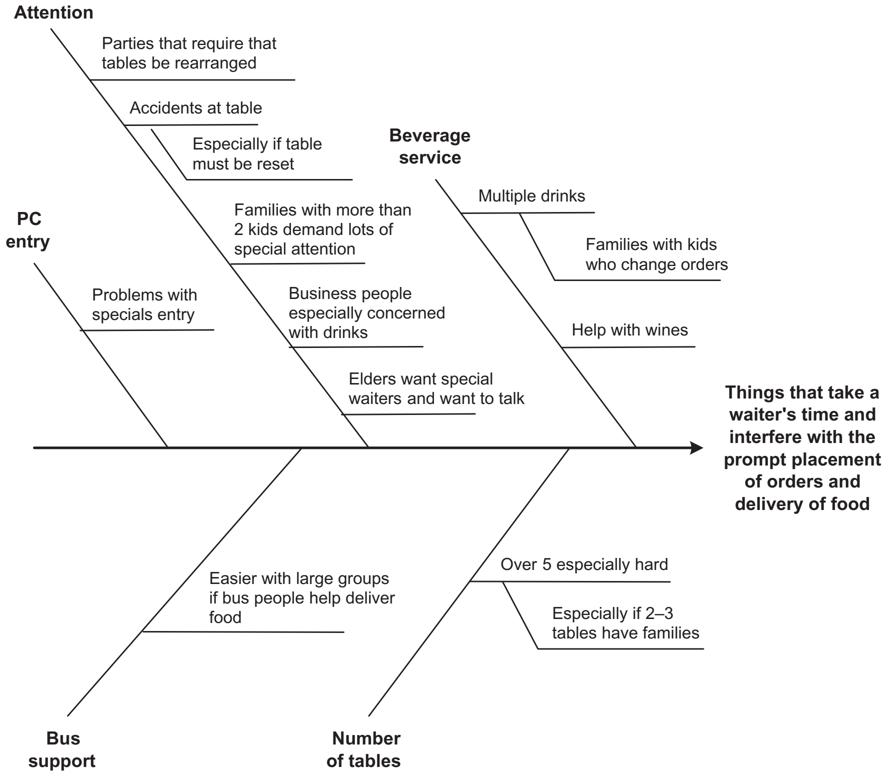


FIGURE 12.6

Cause-effect diagram developed by SF Seafood's Six Sigma team.

In the end the SF Seafood team gathered data on several causes. The team voted on the causes that were really costing the most time. They used a method in which each team member indicated which problem they thought was the worst cause of time delays, the next worst, and the third worst. The results were as follows:

Families with kids	10
Number of tables	8
Tables wanting help with wines	5
Multiple drink tables	3
Lack of bus person help	2
Elders wanting to talk	2
Accidents and spills at table	0
Problems with PC entry	0

One of the issues raised by this analysis was the control and placement of families. This is normally done by the *maître d'*. An experiment was developed, and after 2 weeks, it was determined that waiters who did not have families in their areas definitely provide faster average service. It was also determined that a waiter with six tables who got two groups with more than two kids each was likely to go over the 18-min upper limit. As a result the team decided to change the definition of the process. The new process included a new subprocess—customer seating—and it included the *maître d'*s placement of customers within the various waiters' areas.

At this point a Six Sigma team usually gathers a lot of data to validate the effect of the different causes identified by the team and to determine their relative salience if possible. We will not consider the various data-gathering techniques or the statistical techniques used by teams to examine the data. In the case of the SF Seafood team the data confirmed the list that the team previously generated.

Improve

As data are gathered and results accumulate the team begins to think of ways to improve the process. In this case they are guided by their prioritized list, which highlights the improvements that are likely to result in the largest change.

In the case of SF Seafood a lot of effort was put into determining how the *maître d'* could more effectively allocate customers to waiting areas. It was decided, for example, that two groups of families with kids would never be put in the same area. It was also decided that, when families with more than two kids were placed in an area, the number of tables the waiter in that area handled would be reduced and the extra table would be reallocated to another waiter. It turned out that an additional waiter was needed for peak weekend periods to keep the number of tables per waiter below five, or four with a multikid family.

In addition, it was determined that the restaurant would hire a wine steward and have him or her available during peak periods. When customers requested help with wines they were turned over to the steward, who was popular because he or she ultimately knew a lot more about the restaurant's wines than most of the waiters.

During this period changes are evaluated and some are put into force. Additional data are gathered to see if the changes are resulting in a more consistent process.

In the case of SF Seafood changes in customer placement, limits on tables per waiter, and the wine steward resulted in a 2-month period in which no diner had to wait longer than 15 min for his or her food. The mean for the order and delivery aspects of the process actually decreased to 8 min.

Control

The last phase usually results in a plan to maintain the gains and sometimes, in new initiatives, to improve the process further. Deming and a wide variety of other experts have observed that what gets measured gets done.

Large manufacturing companies with production lines constantly sample and evaluate their output. Parts' suppliers in sophisticated supply chain systems can only guarantee that their parts are 99.73% defect free because they maintain constant vigilance. This type of quality control costs money and is a necessary part of the process. There are statistical tools that make this kind of control more efficient. Many processes today are monitored by computer systems that derive data from sensors, automatically analyze the data using statistical tests, and report any unacceptable deviations to a human monitor.

In other organizations, once a process has identified and achieved a set of process goals, some of the measures are dropped because they would otherwise increase the cost of the product. It is important to maintain some measures, however. As we have suggested, measurement and control are a key part of every manager's job and should be done routinely. Process managers should routinely measure customer satisfaction to ensure that the process is achieving its goals. Managers responsible for subprocesses need to determine a reasonable compromise between excessive measurement and enough measurement to ensure that processes remain efficient and effective. Usually, this results in periodic checks that can become more frequent if problems are detected.

In some cases Six Sigma practitioners recommend that managers develop a response plan, a list of actions tied to specific activities that the manager can take if specific activities within a process begin to deviate significantly from established measures. For example, the *maître d'*, who is the process manager for dining service, began to explore ways of using bus people to save waiters time. Overall, however, everyone was happy with the results obtained from the project. The *maître d'* discontinued bringing in someone to time service, but he occasionally asked a waiter to come in 1–2 h early with the objective of timing the other waiters just to see that they continued to maintain that 8-min average. Moreover, once every other month a week was selected and evaluation postcards were distributed to all diners to continue to monitor their satisfaction. And the *maître d'* kept scanning local restaurant websites to see if any complaints showed up there.

Lean

The literature of Lean began with the publication of *The Toyota Production System* (in Japanese) by Taichi Ohno in 1978. (The book was not published in English until 1988.) The book that started US managers talking about Lean was *The Machine that Changed the World* by James P. Womack, Daniel T. Jones, and Daniel Roos in 1990. In 1997 Womack went on to found the Lean Enterprise Institute, a nonprofit group that provides training courses and has published a series of books and workbooks to help analysts learn about specific Lean techniques.

Like Six Sigma, Lean began in manufacturing and relies on a variety of statistical and quality control techniques. For a while the two movements remained more or less independent. Six Sigma focused on improving the quality and consistency of process outputs, whereas Lean focused on improving the flow of activities and reducing the cost of a process by reducing several forms of waste. More importantly, training and consulting companies focused on either Six Sigma or Lean. In the past few years, however, that has changed. As the influence of Six Sigma has waned at many organizations and Lean has become more popular, many Six Sigma groups now market themselves as Lean Six Sigma companies and offer methods that seek to blend the benefits of Lean and Six Sigma. On the other hand, many Lean groups prefer to maintain their independence, and would rather just be called Lean practitioners.

Interestingly, there has never been a Lean or Six Sigma Association that was in a position to establish a definitive standard for what either Lean or Six Sigma means, or what a green or black belt requires, and each company that provides Lean or Six Sigma training or accreditation follows its own rules. The group that comes closest to being the standards body for the Lean Six Sigma tradition is the American Society for Quality (ASQ), a professional association that offers certification in Lean and Six Sigma.

Most Six Sigma books suggest that Six Sigma practitioners should be interested in three broad areas: the overall management of process change, usually called business process management; the redesign of processes that require major changes (*redesign*); and the improvement of existing processes. In reality, however, most Six Sigma books until recently have focused almost entirely on process improvement, just as we have throughout most of this chapter.

There is a specialized area of Six Sigma that focused on new product design, usually referred to as Design for Six Sigma, but it is really a special engineering process for designing new products and is only used by a small and specialized group of Six Sigma practitioners.

Lean, on the other hand, derived from the process improvement approach developed at Toyota, and many prefer to refer to Lean as the TPS or the Toyota Way to stress that it is a comprehensive approach to managing and improving Toyota's corporate efforts. Figure 12.7 is taken from an overview of the Toyota Way developed at Toyota. In essence, the Toyota Way is supported by two key principles (or pillars): *continuous improvement* and *respect for people.* Those principles in turn stand on five basic approaches or tools, which we will consider in turn: *Challenge* refers to the Toyota philosophy or to long-term thinking; *Flow Kaizen* and *Process Kaizen* refer to the Toyota improvement method; and *respect* and *teamwork* refer to interactions between managers and employees, and interactions of teams. The Toyota Way is a systems approach that emphasizes results, but it also prescribes some of the means that the organization is committed to using along the way.

We will not consider all the tools that Toyota employees use, but we will consider some. For example, Lean practitioners usually speak of two kinds of Kaizen: enterprise or "Flow Kaizen" and a process-level or "Process Kaizen" method. In essence, Flow Kaizen focuses on improving the flow of the high-level value stream, whereas Process Kaizen is focused on the elimination of waste. As a further generalization, Flow Kaizen is the concern of senior management, whereas Process Kaizen is the responsibility of the line workers.

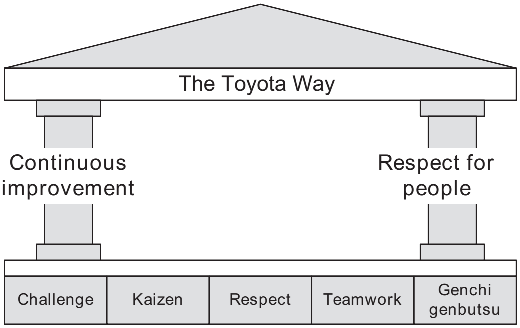


FIGURE 12.7

Overview of the Toyota Way.

From An internal Toyota training document.

Flow Kaizen

The chief tool of the Flow Kaizen practitioner is a high-level diagramming technique called value stream mapping. Many Lean practitioners skip value stream analysis and jump right to identifying specific sources of waste and removing them. Unfortunately, this often results in local improvements, but rarely results in significant improvements in the overall value stream or in improved products for customers. To really have an impact you need to begin by streamlining the entire value stream, and only after that drill down into specific processes to eliminate waste.

Figure 12.8 illustrates a value stream map. The first thing to notice is that it provides a view of an entire value chain (which Lean practitioners usually refer to as a *product line*). In designing a value stream map, one begins at the upper right with the customer (distribution in Figure 12.8). The customer begins the process with weekly orders. In a similar way, the process ends with the daily delivery of product to the customer. Thus the value stream map shows a complete product cycle from order to delivery.

The second thing to notice is that this is a high-level view of a process. The entire value chain in Figure 12.8 is broken into eight subprocesses—the bold boxes.

A value stream map tracks two different types of things. The bold boxes and the wide arrows track the flow of actual product. The thin arrows and boxes track the flow of information (orders, commands, and decisions). In addition, there are symbols for customers, suppliers, and transportation. The bold clear arrows indicate that the item is "pulled" by the upstream subprocess. In other words, the item is moved on demand. The bold-striped arrow indicates that the item is "pushed." In this case the subprocess is a batch operation and forwards items to groups as they are finished. This makes it almost impossible to establish a smooth flow, and Lean practitioners routinely focus on eliminating PUSH processes, replacing them when possible with Just-In-Time processes. The straight thin arrow indicates that information is passed between people, whereas the thin arrow with a kink in it represents an electronic information flow.

The pyramid with a box represents inventory and, in most cases, the map shows what is stored and how long an item is in storage. In some cases icons are placed

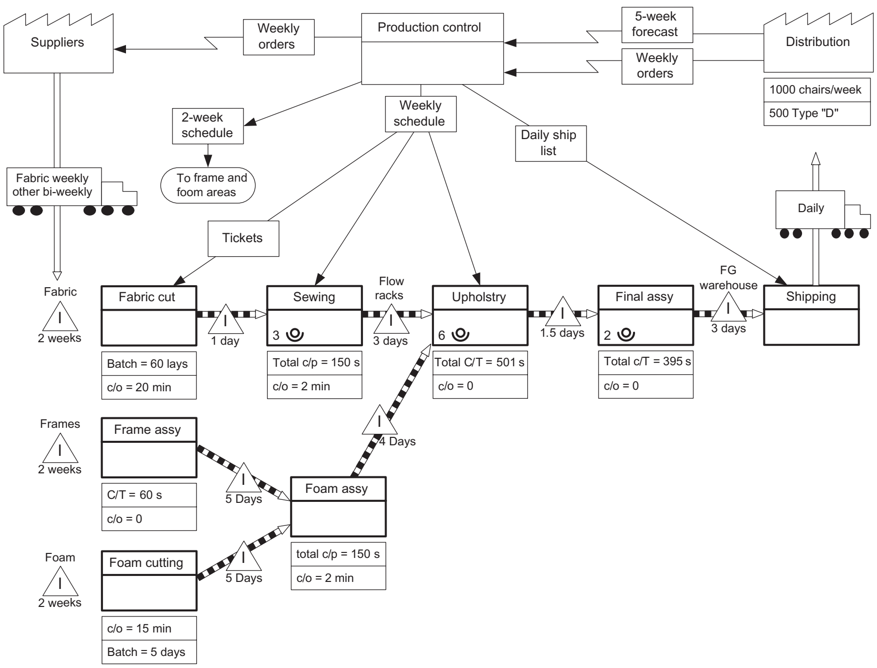


FIGURE 12.8

Value stream map.

From Learning to See by Mike Rother and John Shook.

within the process boxes to indicate how many operators are involved in a process. Finally, beneath each subprocess box there is a secondary box that contains measurement information. In the map in Figure 12.7 there are arbitrarily only two measures per subprocess (and two under the customer box), but there could just as well be more.

Although it is not shown on the map in Figure 12.8 value stream maps often place time lines across the bottom that indicate how long product is worked on within each subprocess, and how long product takes to move between subprocesses. Similarly, there are several symbols that could be added to indicate where *Kanban* activities occur. (Kanban activities involve the systematic use of cards to help schedule and manage the flow of products.)

Process Kaizen

Once a Lean team is satisfied that they have the overall value stream running smoothly they begin to drill down and look at specific processes. In this case they are looking for waste that can be eliminated and this is referred to as Process Kaizen. Lean practitioners begin by defining activities as either value-adding or nonvalue-adding activities, and try to eliminate as many nonvalue-adding activities as they can. The definition of nonvalue-adding activities can be tricky because one needs to distinguish between activities that do not add value but are required to keep the company functioning (e.g., accounting and the tax-paying process) and activities that are neither required nor add value. In essence, one examines activities and looks for seven types of waste. The generation of waste suggests a useless, nonvalue-adding activity. In the Lean world waste results from seven types of activities: overproduction, waiting, transport, extra processing, inventory, motion, and defects.

Overproduction. Overproduction occurs when a process continues to generate outputs after it should have stopped. This occurs because the process does not rely on a *just-in-time* schedule or because it does not get feedback from an upstream process to stop production.

Waiting (also known as queuing). This refers to periods of inactivity that result when an upstream process does not deliver an adequate supply of a required input on time. Often, as a result the affected process then proceeds to do nonvalue-adding work or is engaged in overproduction of some alternative output.

Transport. This refers to the unnecessary movement of materials. Ideally, a work-in-progress should pass from one workstation to another without being stacked, stored, or handled by anyone not directly involved in adding value to the work-in-progress.

Extra processing. This refers to any extra operations, any rework, or any movement of work to storage. It also includes situations in which the customer is asked the same question twice because the information, despite having already been obtained and recorded by one worker, is unavailable to a second worker.

Inventory. This refers to any excess inventory that is not directly required for current customer orders. It includes both excess raw materials and excess finished goods. Excess inventory might also include marketing materials that are created but never mailed or parts that are stocked but never used.

Motion. This refers to any extra steps taken by employees when they perform their tasks. It refers to employees who have to move to access tools or a telephone, and it refers to an employee who has to walk to another area to pick up items that he or she needs to process.

Defects. This refers to any output that is unacceptable to the downstream process or the customer. Similarly, it can refer to situations in which incorrect information is entered on forms. All rework is waste.

As you can see, there is a bit of overlap between the different categories of waste. The essence of Process Kaizen lies in its capacity to identify and streamline a process so that all work is done in the most efficient manner possible. There is not much emphasis on automation in most Lean books, but obviously document-processing workflow systems that scan forms and then move them instantly from one workstation to the next fulfill a major Lean goal.

Management, Teams, and A3 Pages

The TPS assumes that employees will be organized into teams that will take a bit of responsibility for their own work. Indeed, if you watch a team in a Toyota factory you may see a worker complete a task a few seconds faster than the others. When that happens team members cluster around to learn what happened. Perhaps the employees did something wrong in which case they need help, and perhaps a memo should be sent to training to correct a defect in new employee training. Or, perhaps the employee has figured out a new way to do the task that is faster but still results in product that is just as good. In that case the other team members want to learn what was done so they can improve their own routine. Toyota's incentive systems are designed to encourage and reward this type of teamwork.

Equally importantly, Toyota's factory supervisors are trained to mentor employees rather than to "control" them. In essence, the supervisor's job is to encourage the growth of the teams he or she manages. One of the popular tools supervisors use is termed an A3 document. A3 is an international paper size that is approximately equivalent to 16×11 in. It is also the popular term for the way that Toyota's managers communicate with each other about projects. By extension, it is a popular term among Lean practitioners for a communication process management tool.

Supervisors use an A3 sheet of paper to describe a problem and a proposed solution in conjunction with their employee team. The idea is that the supervisor summarizes a problem and the solution on a single, large sheet of paper, which he or she then presents to his or her own manager for approval. The A3 page (document) is discussed. In many cases the senior manager suggests ways in which the supervisor might improve problem analysis and its solution. In these cases the supervisor takes the A3 document back to the team, revises the document, and then resubmits it. Done correctly the A3 page can structure the ongoing dialogue between the supervisor, his or her employee team, and a senior manager. The submittal, review, and rewrite of the A3 document structures a mentoring process that guides the development of the new supervisor. The size of the paper enforces a discipline on the dialogue. The problem must be summarized at a high level.

There is no single, official way to lay out the A3 document—although most managers treat the page as if it were two 8×11 pages placed side by side. Figure 12.9 illustrates an A3 diagram pictured in John Shook's book *Managing to Learn: Using* the *A3 Management Process to Solve Problems, Gain Agreement, Mentor and Lead.* This A3 layout follows a common approach that summarizes a project in the following terms:

Title (Process to be improved.)

1. Background (How big and how important is the problem?)
2. Current Conditions (How much? How many? How long?)
3. Goals/Targets (What would a solution look like?)
4. Analysis
5. Proposed Countermeasures (What should we do?)
6. Plan (How should we go about the solution?)
7. Follow-up (How should we follow up to ensure the solution works?)

John Shook's book is organized around a case in which a senior manager works with a new supervisor to solve a problem. Their interactions are structured by A3, but the goal of the senior manager is ultimately to develop the thinking skills of the new supervisor and the employee team. Along the way we learn much about the way the skilled senior manager uses the A3 page.

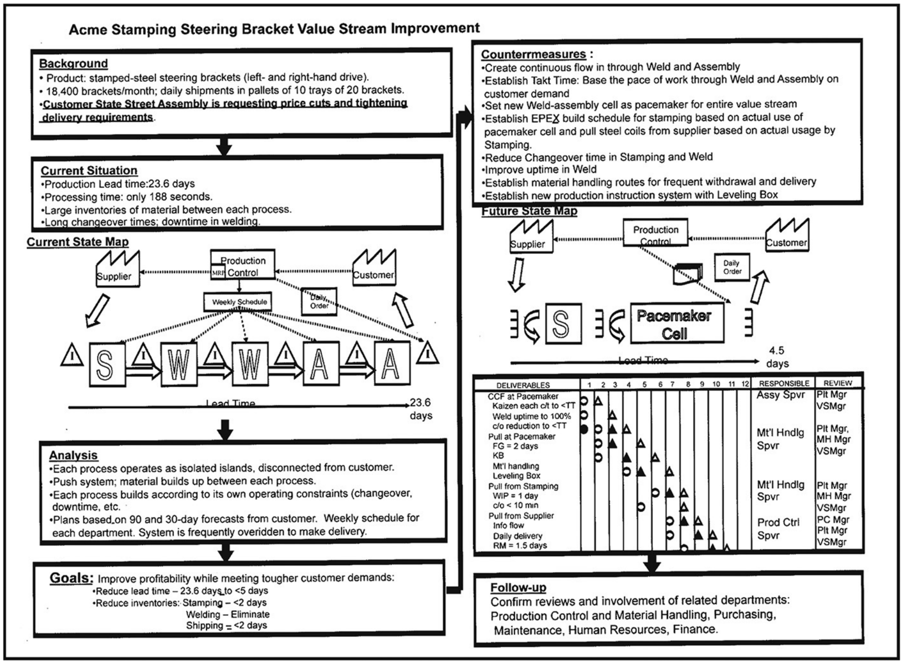


FIGURE 12.9

A3 worksheet.

Modified from Managing to Learn.

Having read the book, for example, one learns that it is a foolish junior manager who tries to fill out the complete A3 document after one look at the problem. By the second or third iteration the supervisor and the team realize that they had better understand the real root causes of a problem before they propose a solution. On the other hand, the supervisor is encouraged to submit the A3 page on something like a weekly basis, so he or she learns to focus initially on a good problem statement and only gradually moves beyond that.

The A3 page pictured in Figure 12.9 is the result of a couple of months of effort. Our junior manager has learned to use a variety of tools, and he or she has examined the problem many times, interviewing different people and gradually digging deeper and learning more about the problem.

Summary

Earlier, when we talked about the BPTrends methodology, we primarily focused on having a project team redesign a broken process. We carefully discriminated between projects on the left of our process problem table (see Figure P2.1) and problems associated with the day-to-day management of processes, which lay on the right side of our problem matrix. Either Six Sigma or Lean can be used by a process team to redesign a business process. As a rule, however, they are used to improve a process that is already working in a satisfactory manner. They are used as part of a continuous improvement effort undertaken by the process manager and the employees who are working on the process on a day-by-day basis.

Figure 12.10 reproduces the Capability Maturity Model that we first discussed in the Introduction to this book. Those who examine the progression that organizations go through are often surprised to see that the most mature organizations are focused on employee teams and continuous improvement. This assumes that Level 5 organizations have already redesigned their major processes and eliminated all the obvious problems. They may need to redesign a process when some new technology makes a major improvement possible, but having finished their initial process improvement work such organizations as Toyota focus on creating learning organizations with empowered employees who work to constantly refine and improve their existing processes.

One of the things missing from Lean, as it is generally explained, is any sense of development. Lean does not have anything akin to Capability Maturity progression because it was derived from the TPS, which is already a Level 5 organization. When Level 2 or Level 3 organizations begin their process journeys they typically find that it takes time and considerable effort to devise and incorporate practices into their culture that Toyota takes for granted.

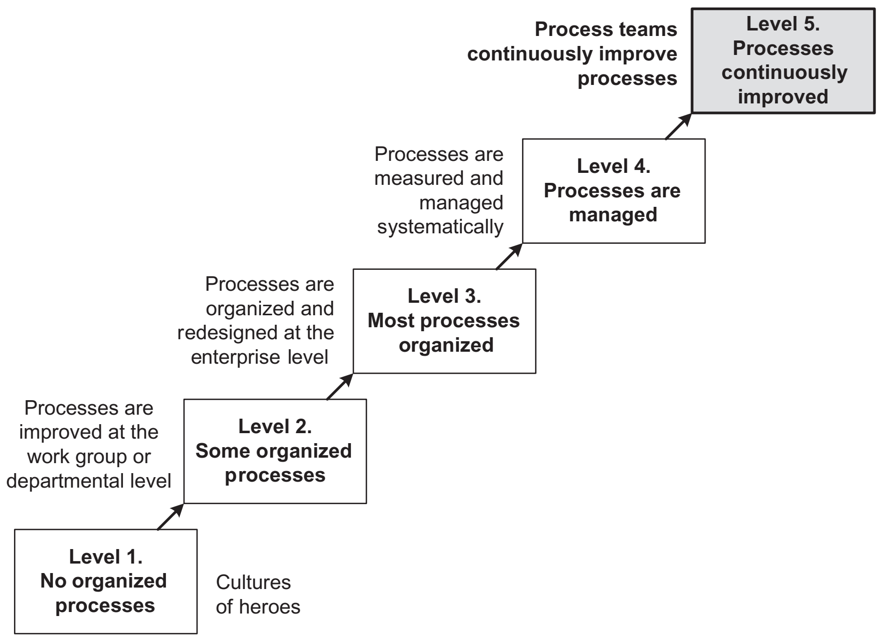


FIGURE 12.10

Capability Maturity Model with the fifth level highlighted.

Notes and References

The basic flow of the SIPOC diagram is similar to the project scoping diagram we considered in Chapter 8, but it ignores the management of processes, the controls exerted by policies, rules, and other external management processes, and the influence of support or enabling processes such as HR and IT. This is just another way of saying that Six Sigma improvement projects focus on narrowly defined processes, while redesign projects focus on the broader context, as well as the process.

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The automotive data are from an IMVP World Assembly Plan Survey conducted in 1986. I discovered these data in a booklet written by Ken Orr, entitled *Creating the Smart Enterprise: Business Process Reengineering in the Real World*, which was published in 1998 (copies can be obtained from the Ken Orr Institute). More information is available at http://www.kenorrinst.com.

The International Society of Six Sigma Professionals (http://www.isssp.org) sponsors meetings and training sessions in Six Sigma techniques.

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CHAPTER

A comprehensive redesign methodology 13

In earlier chapters we considered how a company might decide to modify a process or select a specific process for redesign. In this chapter we want to consider how a company might go about redesigning a business process or creating a new process. For our purpose here we will assume that the process to be redesigned is a reasonably large process and that the company involved wants to do anything it can to make the process more effective. In other words, we will be considering a methodology for a significant business process redesign effort.

This chapter will provide an overview of how analysis, project management, change management, communication, and facilitation must all be woven together to achieve results. Obviously, no actual project requires all the techniques we have considered in this book. We have simply chosen a case that demonstrates many of the techniques that a process redesign team might require. We note in passing that a process redesign team might well be a team specially assembled for this project: it might be a Lean Six Sigma team, or business analysts, or even a manager who assembled a group of employees to try to improve the process he or she was responsible for managing. It will also suggest how a team can be assembled and suggest some of the roles that will be required.

A number of books have been published describing redesign methodologies. Most focus on major phases, as we do here, and some go into exquisite detail, defining a process with hundreds of tasks or steps. The methodology we describe here was created to structure the training of new process change practitioners.

We introduced the methodology in Part I of this book when we discussed business architecture development. In essence, we suggest that companies develop a business process architecture and create institutions that will allow the company to prioritize its subsequent process work. We refer to the methodology that puts a business process architecture in place as a business architecture methodology. If this methodology is used, then an enterprise-level business process management (BPM) group will prioritize and scope future business process change efforts. Unfortunately, most companies lack a sophisticated enterprise-level process capability, and thus the process redesign methodology was designed so that it can either accept information at the enterprise level or generate the information needed to redesign a project from scratch (see Figure 13.1).

A process redesign methodology assumes a process redesign project that takes place in five phases. Once the project is complete it assumes that the process and associated process management system will work together to execute the process

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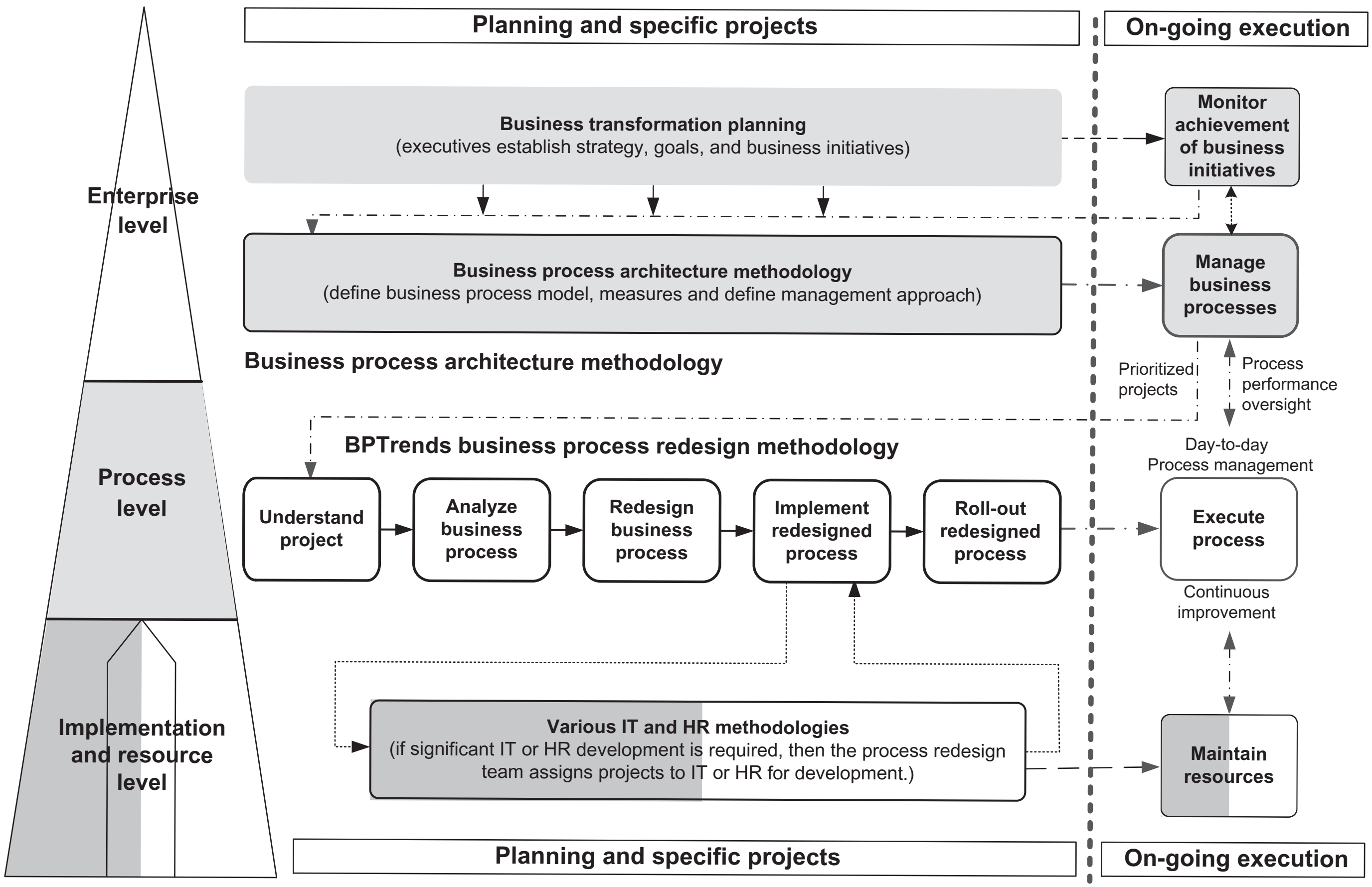

FIGURE 13.1

BPTrends process redesign methodology.

on a day-to-day basis, and that one of the major roles that the process manager will undertake is the maintenance and improvement of the process on an ongoing basis. The methodology also assumes that most implementation phases of most projects will involve other groups, such as IT or HR, in the development of components, such as training courses and software applications, which will be needed for the new process design.

The methodology is designed to provide a framework for a variety of best practices. It assumes that most organizations will already be using specific techniques, such as Supply Chain Operations Reference, the Balanced Scorecard, and Lean Six Sigma. Thus the methodology is designed to provide a project framework into which more specific techniques and practices can be incorporated.

Figure 13.2 takes a somewhat different look at a process redesign project. In this case we picture the five phases in the middle of the diagram, and surround them with some of the broad concerns that anyone contemplating a major process redesign project should consider. Just above the five phases we suggest that anyone undertaking a process redesign project will need a variety of modeling, analytical, and design techniques we focused on in Chapters 8–11.

Below the five phases in the center of Figure 13.2, and in addition to analysis and design techniques, we suggest that individuals will need skills in conducting research, interviewing, and group facilitation. In other words, you can't analyze information until after you've acquired it. In most cases you do this by asking questions of employees and managers who perform the process you are attempting to redesign. In other cases you must gather and analyze data from reports and historical records that document how the process has behaved in the past.

The outer section of Figure 13.2 suggests two more skill sets required for a process redesign project. At the top we list project management. A process redesign

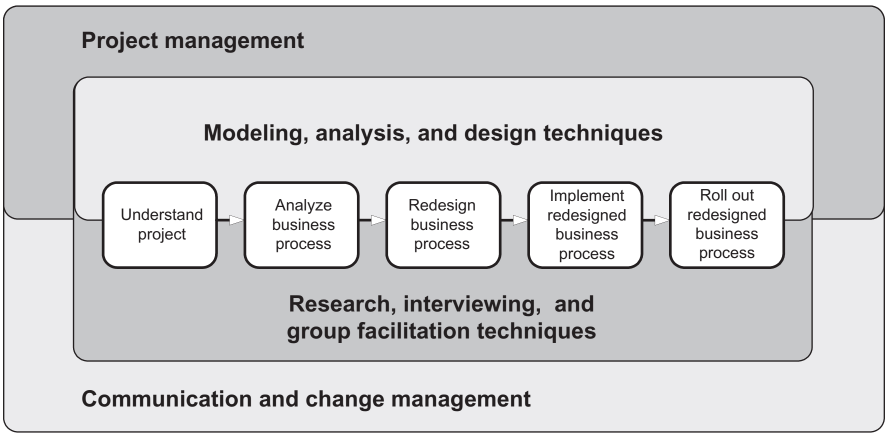

FIGURE 13.2

Overview of the techniques and skills required to successfully undertake a business process redesign project.

project is, first of all, a project. Projects need to be managed and process redesign team leaders need training in project management skills. They need clear goals, a plan, a schedule, a team, milestones, and all the other things that ensure that the work gets done in an orderly manner.

At the same time, the project team needs a communication plan. The team manager needs to talk with those working on the project and he or she needs to sell the changes to be made to all stakeholders affected by the change. Some might prefer to call this *change management*. Whatever it is called it requires its own set of skills. People resist change and their resistance is usually overcome only when someone explains how the change will benefit them. That requires that the person managing the communication understand the needs and interests of each of the process's stakeholders and manages to communicate with them in terms they understand.

We have already discussed analysis, modeling, and design considerations. In this chapter we will talk more about management and communication issues. We don't really address interviewing and group facilitation in this book, but we recommend some good books in the Notes and References at the end of this chapter that will provide interested readers with some help in this important area.

We strongly recommend that companies use an experienced facilitator to actually manage a redesign project. The facilitator might come from a redesign group inside your organization, or he or she could be an outside consultant. In either case the facilitator will probably have his or her own specific approach to business process redesign. What we want to do here, however, is to provide managers and redesign team members with a broad overview of what will happen in almost any large business process redesign effort.

The methodology we describe is best suited for a large-scale effort. Some changes in business processes are routine. They are adjustments made to correct a minor problem or to implement some minor change in the ways things must be done. A change in the price of an item, for example, must be communicated to salespeople, altered in sales catalogs, and changed in software systems. These changes are initiated by the process manager who is responsible for the process or by departmental managers who are responsible for the specific activities that need to be changed. We are not concerned with such routine changes. Instead, we describe an approach that can be used to undertake a major overhaul of a value chain or a major business process.

Major business process redesign projects are usually managed by a steering committee and undertaken by a team that represents all the functional managers involved in the change. Unlike the less formal techniques used by managers who need to adjust a process a major business process redesign effort usually requires a systematic methodology that defines phases and responsibilities and provides the basis for a project plan and schedule. A significant part of the effort will involve keeping senior managers in the loop—communicating with them—to ensure their support when it's time to implement the process. This communication process isn't a direct part of business process redesign, but it's vital to ensuring the changes get implemented. Ensuring that your team has someone knowledgeable to manage the entire project, including all the communication aspects, is another reason we recommend the use of an experienced facilitator.

Why Have a Methodology?

Large projects take time and involve many different people. If they are well planned they can be conducted efficiently, minimizing the time required of those involved to ensure that results will be obtained in a relatively short time. Outside consulting companies routinely analyze and redesign large business processes in 3–6 months. On the other hand, we know of projects that started analyzing a process and were still at it 2 years later when the whole project was scrapped. Projects that lose their way usually do so because the people involved don't have a good plan, don't have concrete milestones, or don't have practical criteria that allow them to decide when a task or phase is complete.

What's even worse than a project that gets lost in the swamp of analysis is a project that completes its work and submits a good redesign that never gets implemented. Implementation failures occur because key departments, managers, or employees haven't committed to the project. A good redesign effort requires a lot more than a process redesign. It requires that the company go through a change process that systematically gains commitments from all relevant stakeholders. At the same time, it requires that the implementation be planned with as much care as the redesign and that managers and employees involved in the process have their job descriptions and incentives changed so that they are judged, and rewarded, when the project meets its goals. If customers or other companies are involved care must be taken to ensure that their people are just as committed to the new process as your company's people are. Thus the methodology we describe is not simply a plan for redesigning a process. It's a plan both for a redesign and for securing the support of all the people necessary to ensure that the new process will be implemented.

How Does It All Begin?

In the earlier chapters of this book we described an enterprise alignment cycle. We argued that every organization should establish a process that linked corporate strategy and business initiatives with a business process architecture group. The business process architecture group in turn should identify process changes mandated by changes in corporate goals and then generate a prioritized list of projects. Each project should be assigned a sponsor who is responsible for undertaking the project and ensuring that the scope of the redesign corresponds with the goals the executive committee and the architecture group set for the project. In this chapter we won't concern ourselves with strategic and architectural functions, but assume that somehow a senior manager has been assigned goals and the responsibility for improving a business process. Thus, for our purposes here, a project begins with a senior manager who is responsible for undertaking a business process redesign.

What Happens?

Figure 13.1 provides a very high–level overview of the phases in our redesign process methodology. The project begins with Phase 1 when the responsible manager sets things going. Typically, the manager, who we usually call the project sponsor, retains a project facilitator who will manage the actual process analysis and redesign effort. The facilitator then works with the project sponsor to develop a plan and schedule and to select other individuals to take part in the project.

Ultimately, the planning effort results in a business process redesign team that includes a wide variety of members, including process managers, employees, IT specialists, and others concerned with the process. This team documents the current process, but only goes into as much detail as seems appropriate.

Once the analysis is complete the same or a modified team considers various redesign options and arrives at the one they think best. After the redesign is approved a development plan is created that requires efforts from everyone involved in creating the products necessary for process change.

Finally, after each of the specialized groups has completed its work the new process is implemented. Assuming all goes well the new process is used until managers find a need to correct it, or until the strategy and BPM group determines that the process should be revised again in response to still newer threats or opportunities. We'll consider each of these phases in some detail below.

To keep things simple we assume that the process redesign project is confined to a single company or division. Many e-business applications, especially supply chain–driven redesign projects, involve organizing several companies to work together. The essential process is the same as we will describe, but the establishment of steering committees and design teams can be a lot more complex. In some cases goals and plans may need to be specified in legal contracts before the redesign team can even begin its work. In these cases a strong BPM group is especially important.

Who Makes It All Happen?

Obviously, the names of groups and job titles will change from one organization to the next. Broadly, however, we assume that the ultimate decisions are made by a group that we'll term the *executive committee*. In Figure 13.1 we refer to the group as being involved in transformation planning and generating goals and business initiatives. The executive committee may include a strategy group and a BPM group, or these groups may report to the executive committee. The strategy group provides inputs to the BPM group, which, with the approval of the executive committee, decides what business processes need to be redesigned. However it is organized in any specific company the executive committee is probably made up of the CEO, the COO, and the heads of major departments and business units. The executive committee is responsible for adopting new corporate strategies and setting corporate goals. Once goals and strategies are adopted the BPM group is responsible for determining which value chains or business processes should be modified to achieve new strategies or goals, and developing plans to ensure they happen. The BPM group may have many of the same members as the executive committee, or it may have more specialists and planners.

A major redesign effort takes time and consumes the efforts of lots of executives and managers. Thus it is justified only when it is determined that minor changes won't produce the desired result. A major redesign is usually undertaken only if the organization makes a major shift in its strategic orientation, or if a major new technology is to be incorporated that will impact a number of different subprocesses and activities within a major business process.

Once the executive committee decides a process redesign effort is justified someone must be assigned to oversee the project. If the organization already has a process orientation and process managers, then the person responsible for the project is the process manager, and the project steering team is made up of a team of managers who normally work together to oversee the process. In this case the project sponsor is either the project manager or someone directly appointed by the project manager. In companies that do not currently have process managers a project sponsor must be appointed by the executive committee. Since one of the goals of a serious process redesign effort should be to reorganize the process management system the person appointed as project sponsor in this case is usually the individual who will emerge as the process manager when the redesign is complete. However it's arrived at the project sponsor is the individual who is ultimately responsible for the redesign project. He or she does not manage the day-to-day work of the redesign team, but is responsible for approving major decisions and working with members of the executive committee to ensure broad support for the work of the redesign effort.

At the same time a *process redesign steering team* should be established. This team usually consists of high-level representatives of all of the departments or functions involved in the process. In some cases the BPM group serves as a permanent redesign steering team. In other cases the team is a subcommittee of the executive committee. In any case you need to create such a team. This team has two key functions. First, it must approve the work of the redesign team and, second, its members need to ensure that the managers and employees within each of their respective organizations understand, support, and will implement the redesigned process. The work that goes on with the redesign steering team is just as important as the redesign work itself. The team members must be powerful enough to commit their functional groups and to ensure that their managers will be held accountable for a successful implementation effort.

Next, an individual needs to be selected to actually facilitate the process redesign effort. In some cases this individual is a consultant who comes from outside the organization. In other cases he or she comes from a business process group within the company. In either case it's important that this individual is neutral and doesn't have any stake in, or any commitment to, the functional groups that will be engaged in the redesign effort. The *project facilitator* should be a consultant who understands how to facilitate process redesign. The facilitator does not need to understand how the specific business process works. Instead, he or she should be skilled in working with a design team to ensure that they succeed within a reasonably short time. A good facilitator is key to ensuring that analysis and design occur on schedule and don't get bogged down in any effort involving unnecessary analysis.

Finally, a *process redesign team* should be established. This group will actually struggle with the details of the process and make the choices about how to redesign the process. The team is usually composed of managers or supervisors from each of the major subprocesses or activities involved in the process. In most cases technical specialists from HR and IT should also be included on the project redesign team.

Phase 1: Understanding the Project

Ideally, the goals and overall schedule of any specific process improvement effort should be defined and limited by a charter or plan issued by the BPM group. The plan may have come from the strategy committee or the executive committee. If no project plan exists the team responsible for the specific business process improvement effort will need to develop a plan. Specifically, they will need to determine the organizational strategy and the goals and initiatives that the specific process is expected to support, and they will need to define how the specific process relates to the company's other processes and to company customers and suppliers. In effect, they will need to generate a limited version of the company strategy to define and scope their task.

Assume that a BPM group has assigned a priority to the project, created a general plan, and assigned a project sponsor. In that case the first task of the project sponsor is to identify a steering committee, "hire" a facilitator, and oversee elaboration of the project plan. In most cases the project facilitator manages the actual day-to-day work of the project. In some cases the facilitator will be an outside consultant, and in other cases he or she may be an internal facilitator provided by a corporate business process improvement group. In either case the facilitator will probably begin by interviewing a number of people to ensure that he or she understands what everyone expects. In effect, the facilitator begins by checking the completeness of the plan.

Interactions between the project sponsor, the steering team, and the facilitator will also help refine the project plan. The same group should also work together to assemble the process design team—the individuals who will be responsible for actually analyzing the existing process and then developing the new process design.

In most cases it is the project facilitator who actually writes out a formal planning document and then modifies it after he or she receives inputs from the sponsor and other team members.

Once the project plan and a schedule are completed they should be reviewed in a joint meeting that includes everyone involved in the project. This is a critical meeting, and the outcome should be an agreement on the scope and goals of the effort to be undertaken. If someone's unhappy with the project this is the time to deal with it.

Otherwise, throughout the other meetings and later, during implementation, you are likely to have someone resisting the new process.

Major Activities

Figure 13.3 provides an overview of what's involved in the planning phase. Figure 13.3 uses a process diagram to show who is involved and what happens in what order. Most of the tall activity boxes represent meetings in which members of all the groups get together to review proposals and agree on plans. These meetings and the consensus-building effort that they represent are an important aspect of any major business process improvement project.

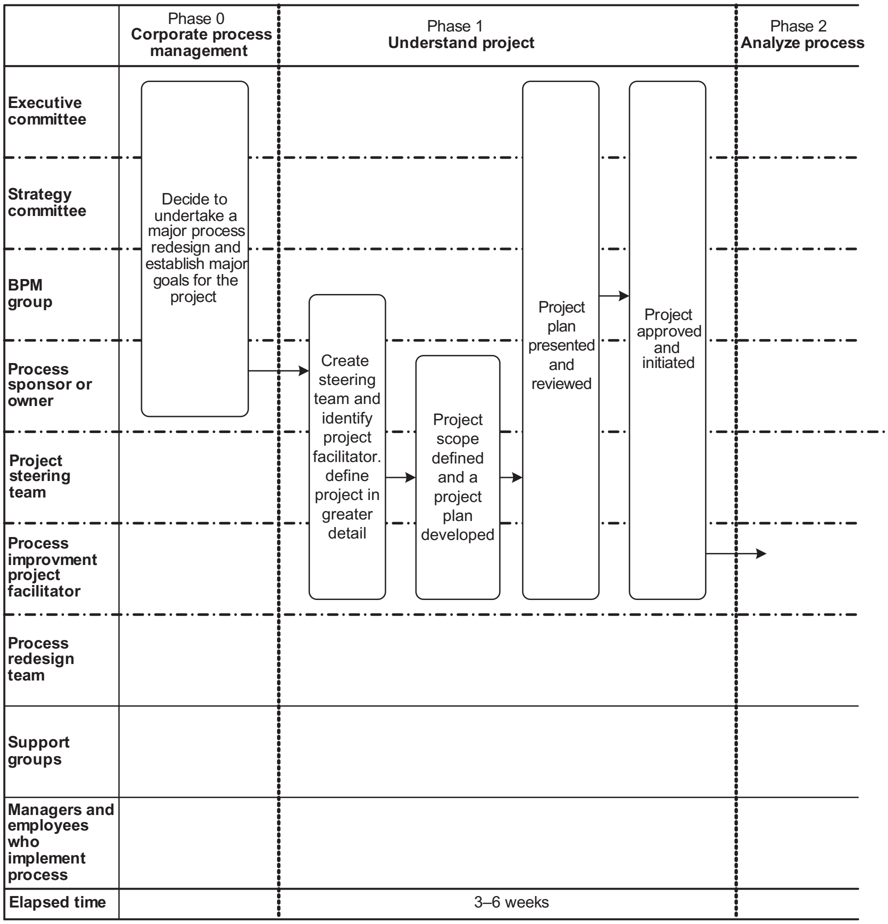

FIGURE 13.3

Overview of Phase 1 of a process redesign methodology.

Most of the detailed work of this phase is done by the facilitator in conjunction with the steering team. Phase 1 involves:

- The executive committee appointing a project sponsor and creating a steering team. They in turn appoint a facilitator and a process redesign team. Most of the detailed work is undertaken by the project facilitator, who interviews senior managers and those currently involved with the process. The facilitator creates and presents draft documents for the sponsor and steering team to review and approve.
- Refining the scope of the process to be analyzed and redesigned. If the corporate committee created documents describing strategy changes, goals, measures, and a description of how the process should be changed, then one begins with them. (This information can be documented on an organization diagram and on an organization goals and measures worksheet, or in any other reasonable format.) The sponsor, steering team, and facilitator should begin by reviewing everything that has been documented. If no documentation of this sort has been prepared, then the team should create it. Unless the BPM group has already done so the team should also review or create a value chain or process relationship diagram to ensure that everyone understands how the specific project fits with other corporate processes. If the project is large the team may want to create a high-level process diagram, define the major subprocesses that make up the overall process, and define their relationships. In this case the team may also subdivide into different groups to then focus on different subprocesses, or they may prioritize the analysis and improvement of subprocesses.
- Reviewing project goals. The team should review the goals set for the project and explore how they relate to corporate strategy and goals. If the process is large or complex the team may want to identify which subprocesses lead to which goals or create subgoals for different subprocesses. If a process management system is going to be created or redesigned, then managers from the different functional units should definitely be included on the redesign team.
- Scoping the project, which once achieved needs to be described and a business case for the project needs to be built. We have discussed this in some detail using the gap model in Chapter 8. The team will review and document project assumptions, requirements, and constraints. The more familiar the team becomes with the specific process, the more likely it will see alternatives or identify constraints that the corporate committees overlooked. The team should document every assumption and constraint it identifies to clarify its thinking about the nature of the process. Facilities, manufacturing machines, computer hardware, and software systems are often sources of constraints. Changing them, or working around them, can often impose huge costs on a project and render an effective redesign impossible. It's important to find out what constraints might limit redesign as early as possible.
- Creating a project schedule and budget. As the team learns more about the specific project it is planning it will either create a schedule and a budget or refine one developed by the BPM group.

- Benchmarking data that describe industry averages for specific types of tasks. Or, in some cases benchmarking data that describe what competitors have achieved. In most cases it's hard to get good benchmark data, although they are widely available for packaged applications from vendors and in some industries from associations. If benchmark data are to be used to determine minimal goals for a redesign effort this fact should be identified in the planning stage and a plan developed to secure them.
- Determining who will take part in the actual analysis effort and identifying the members of the process redesign team. In most cases only some of the members of the team will actually take part in the workshops in which the process is analyzed. The overall team should determine who will take part and arrange for them to be available for the time required. The analysis and design work will take place during meetings, which are often called workshops. It's best to have a neutral, trained facilitator to run the process, and we'll assume one is available throughout the remainder of this discussion.

Outcome

This phase ends with a detailed *project plan* for a specific business process that has been approved by the executive committee, the BPM group, the process sponsor, and the project steering committee. When everyone agrees on the plan it's time to begin Phase 2.

Phase 2: Analyze Business Process

The goal of this phase is to analyze and document the workings of an existing process. Some organizations will have already done this analysis. In other cases the project team will be creating a completely new process, and there will be no existing process to analyze. Still other project teams will decide to skip analysis of the existing process and focus on creating a new process. Most process redesign teams, however, should develop at least a high-level overview of the existing process simply to provide a starting point for redesign efforts. A few organizations will undertake a detailed analysis of an existing process and then proceed to develop a detailed time and cost model of the current process to run simulations to study how specific changes would improve the efficiency of the existing process.

The actual work during this phase is typically accomplished by the facilitator and sometimes during meetings between the facilitator and the process redesign team. The team that is to analyze the process meets with the facilitator. Some facilitators prefer to have the team together for several days in a row and to work through the analysis in one push. Other facilitators prefer to meet for 2–3 h/day, usually in the morning, every other day for several weeks until the analysis is complete. There is no correct way to do this. It depends on the company, the facilitator, and the scope and urgency of the project.

The facilitator runs the meetings and helps the team analyze the problem. The facilitator usually draws diagrams and makes lists on whiteboards or large sheets of paper that are put up around the meeting room. The facilitator is usually supported by a scribe (or analyst) who takes notes as the team makes decisions. If a process-modeling software tool is used it is usually the scribe who uses the tool. The team members don't need to use the tool or worry about it. The main goal of using a software tool is to capture the information and make it easy to print notes and create diagrams to document the process. Between team meetings the facilitator and the scribe work together to ensure that the documentation is accurate. They then print out the documentation so that the team members will have it when they arrive for the next session. A process-modeling tool makes it possible to document a morning session and then provide printouts of the resulting diagrams in the course of an afternoon. Companies that run intensive efforts, where the team meets every morning, are usually forced to rely on a software tool to ensure that the documentation can be prepared promptly between sessions. Software tools are discussed in more detail in Chapters 15 and 16.

Major Activities

Figure 13.4 presents an overview of Phase 2 of the process redesign project. The activities of this phase are undertaken by the process redesign team, guided by the facilitator. Phase 2 involves:

- Ensuring that things move quickly and smoothly. The facilitator usually reviews the plan and interviews a variety of stakeholders to get up to speed on the process and the problems that call for a redesign. In addition, to ensure that the process design team gets off to a good start the facilitator will often create a first-draft version of the process. In this case, rather than having the team define the process from scratch, the facilitator begins by proposing an overview of the process and then works with the process redesign team to refine the first-draft version. This is a reasonably painless way to introduce organization and process diagrams. The facilitator puts up diagrams of a process the team is familiar with and talks them through it. As the diagrams are easy enough to understand the team quickly gets into identifying activities or flows that are wrong or missing.
- Documenting the current (As-Is) process and using process diagrams to document an *As-Is* version of the process. If the process is large begin with a high-level *As-Is* process relationship diagram that identifies the key subprocesses. Then develop a separate *As-Is* process diagram for each subprocess. Repeat this process until you arrive at an As-Is process diagram that shows activities and describes the process in as much detail as the team feels necessary. The goal isn't analysis for its own sake, but a diagram with enough detail so that the team can easily see what will need to be changed to improve the process and to achieve the project's goals. A good facilitator can help the team focus on creating "just enough" analysis and avoid getting lost in details.

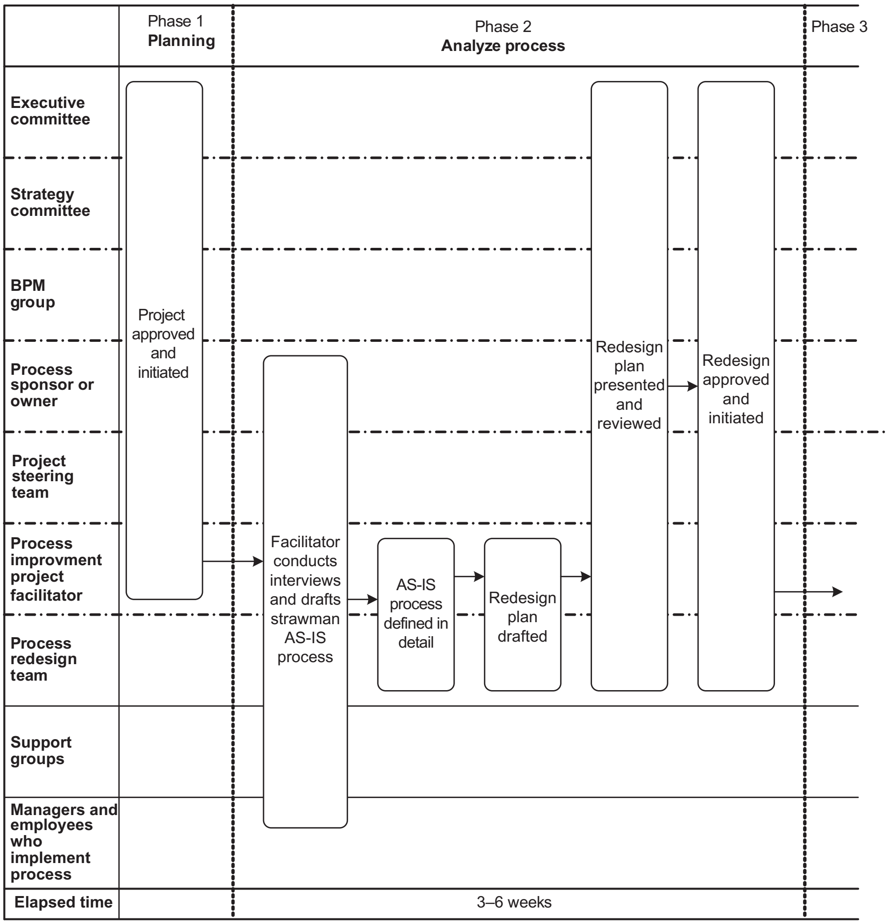

FIGURE 13.4

Overview of Phase 2 of a process redesign effort.

- Agreeing upon the names of processes, subprocesses, inputs, outputs, and activities. Different groups often use different terms to refer to the same processes and activities. One important outcome of a process analysis should be an agreement on what processes and outputs should be called. This is especially hard if many different functional groups are involved, and it's very hard if multiple companies are involved.
- Identifying any "disconnects" or deficiencies in the current As-Is process. Record findings on a process analysis and improvement worksheet. Activities are linked by lines that show where inputs to the activity come from and where outputs go. The lines should be labeled. The flows between activities can be products, documents, information (data), or money. If the inputs or outputs are complex it is probably worth describing them on the process analysis and improvement worksheet.

- Determining the necessary characteristics of each activity. As we've said before we use the term *activity* to describe the smallest unit of the process we intend to model. Each activity needs a name, and it should probably also be given a written description to be sure everyone will know just what it entails. An activity can be performed by an individual, automated by a software system, or performed by a combination of a person and a software system. You should note how each activity is performed. In other cases it may be important to document how decisions are made during an activity. If the flow from an activity branches it is often useful to include information about how the path a given output takes is determined. If many different business rules are used to make decisions it might be worth listing the rules that are applied. If specific goals, subgoals, or quality measures are associated with an activity they should be defined. All of this information should be noted on an activity worksheet or recorded by means of a software tool. This is another point at which interviewing and group facilitation skills are required and where a knowledge of change management will pay off. The team will need to interview people, individually or in groups, to get information about the As-Is process and its problems. The questions to be asked should be well thought out. Moreover, as team members interview employees they will also have to answer questions about the changes that might take place. Employees will want to know what the team is trying to accomplish. Employees will usually leave these interviews with an initial bias for or against change, depending on how the project is explained to them. If the team members are skillful in explaining the project in a way that makes sense to the interviewees and suggest how the work will benefit them the interviewees are much more likely to support the project in the future.
- Developing a process management design. Usually, a subset of the entire process design team made up of managers meets to document the current management process. As we have suggested, the management process involves organizational, process, and functional aspects. It also involves establishing goals and measures for the process as a whole and for each subprocess and activity. And it involves actually taking measures and evaluating deviations from the expected results. If this has been done in the past, then existing managers should be able to provide specific data on which activities and subprocesses have been performing well or failing in the recent past. Similarly, there should be documentation on corrective actions that have been attempted. If these data don't exist the As-Is management team should at least document the structure that does exist and develop a document specifying where the management process breaks down. At a minimum the team should develop a good idea of who is specifically responsible for managing each existing subprocess and activity. Although we have not emphasized it up to this point a process redesign effort typically requires changes in both the specific activities that make up the process and in the management system that monitors and controls the process during its everyday use. In our examination of hundreds of business processes we have consistently found that there were more problems with the management systems that control the process than with the activities that comprise the

process. That is why the team should consider how the management system will support the process before going into the specifics of process redesign. Useless or poorly ordered activities will result in an inefficient process. On the other hand, even a relatively well-designed process that is managed by supervisors who haven't established clear measures or who don't reward behavior that is critical to the success of the process is just as likely to be inefficient. In reality, in any major process redesign effort we usually find opportunities to improve both the process structure and the management system. We will devote a subsequent chapter to management and measurement problems. If the team plans to do cost studies, then each activity should be analyzed to determine its cost, the time it takes, the outputs produced per unit of time, and so forth. Time and cost can be documented on an activity table, but if you are really going to do cost studies and compare alternatives, then it's much better to use a software product and enter the information into tables associated with the activity on the software's product diagrams. This is done on an activity cost worksheet.

- Refocusing on the project goals and challenging old models and assumptions. After process analysis is complete it's usually useful to revisit the goals, assumptions, and constraints defined during Phase 1 and to challenge each one. Can it be achieved? Can you do better? Is the assumption or constraint valid? Is there some alternative that will ease or remove the constraint? Revise the goals, assumptions, and constraints as appropriate. This is a good point at which the team might redraw the gap model to summarize what they have learned and what changes they are considering.
- Recommending changes in the effort as necessary. If, in analyzing the current version of a process, the team realizes that assumptions are wrong or that opportunities exist that weren't previously recognized they should communicate their recommendations to the steering team or the executive committee and suggest changes in the scope of the project effort. Do not proceed to a redesign phase with flawed goals or assumptions. That's just a formula for a project that will end in acrimony.
- Summarizing all the findings in a redesign plan. At the end of the effort the redesign team should summarize their findings and propose a general approach to the redesign of the process. This redesign plan should take into account all the assumptions, constraints, and opportunities the team has discovered.
- Presenting and defending the redesign plan before all the higher level committees and obtaining their approval. Depending on the organization, this may be a public process or it might take place on a one-on-one basis. The key thing at the end of each phase is to obtain the approval and commitment of all those who will later have to ensure that the new process is actually implemented. As with other employees, the team will need to explain the project in terms each executive will understand, explaining the benefits of the change for that executive. If an important manager doesn't accept the proposal it's better to stop and either deal with the objections or come up with a new design. The alternative is to create a plan that will be "dead on arrival," because one or more key managers won't support implementation.

Outcome

The outcome of this phase is a set of documents and models describing the existing (As-Is) process, a draft plan for the redesign of the existing process, and the support of all key senior managers.

Phase 3: Redesign Business Process

The goal of this phase is to create a design for a new or improved process. In some companies this phase is combined with the previous phase, and the design team moves smoothly from documenting the As-Is process to creating a new or To-Be process. In other cases this phase is undertaken without having first undertaken Phase 2, or it is undertaken by a slightly different design team.

The actual work during this phase, as with the analysis phase, is normally accomplished during meetings between a facilitator and the process redesign team. The team that is to improve the process meets for 2–3 h/day, usually in the morning, or for several full days, depending on the facilitator and team member schedules. The number of days or meetings will vary greatly depending on the scope of the project and the level of detail being created or redesigned.

Once again the facilitator runs the meetings and helps the team consider alternatives. The facilitator is usually supported by a scribe (or analyst) who takes notes on what the team decides. Between team meetings the facilitator and the scribe work together to prepare documentation so that the team members will have it when they arrive for the next session. Many software tools include the ability to send results to team members via the Web so they can study them online between meetings.

Major Activities

The major activities in Phase 3 are illustrated in Figure 13.5. Phase 3 involves:

- Reviewing the As-Is process, improving goals, and identifying specific opportunities to change the As-Is process. Depending on the scope of the design team's mandate and the schedule the team may focus on very specific types of improvements or may relax all possible assumptions and speculate about radically different ways of organizing the process. This is the point at which the redesign team ought to do some brainstorming and consider really innovative options.
- Generating a list of possible Could-Be processes and considering the benefits of each. If someone is skilled in TRIZ (from the Russian for "theory of inventive problem solving") this is a good point to use this innovation technique to help generate some alternative possibilities. In most cases the solution will be obvious and the tendency will be to move quickly from the existing process to the obvious To-Be process. That tendency should be resisted if possible and some time should be spent considering if a real breakthrough is possible.

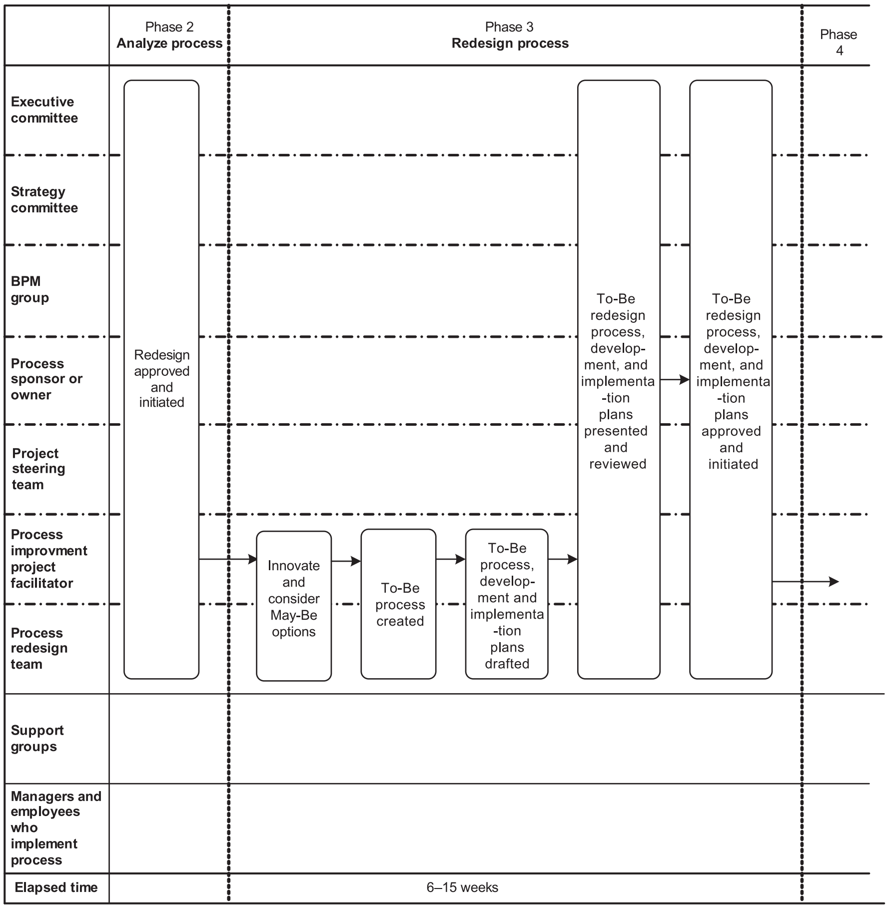

FIGURE 13.5

Overview of Phase 3 of a process redesign project.

A breakthrough isn't likely, but when it occurs it often results in huge savings or sharp increases in productivity, so it's worth considering. Consider how you might reverse each of the major assumptions, and what would result if you did do. What if your agents went to the employee, instead of having them come to your office? What if you shipped the item unassembled, and let the employee assemble it?

- Designing the new or improved process. The team's decisions should ultimately result in a new process that is documented on a *To-Be* process diagram. In complex projects the team may create several alternative *Could-Be* process diagrams and then choose among them. The new design should eliminate disconnects and unneeded activities and streamline the activities, subprocesses, and the overall process whenever possible.

- Designing a management process to support the new To-Be process diagram. The management process should specify who is responsible for each activity and subprocess. It should also establish measures for activities and subprocesses. This should be indicated on a role/responsibility worksheet.
- Rationalizing reporting relationships. In some cases changes in a process may suggest a new organizational chart that regroups employees and creates reporting relationships that will allow improved accountability and efficiency. New processes will often require that new employees and new reporting relationships are created. In either case the team should prepare a new organization chart indicating the hierarchy and reporting relationships of employees involved in the new or redesigned process. When appropriate, the process redesign team should review the actual jobs or roles involved in the process, and determine which functional managers will be responsible for which of the new process activities. This information is recorded on one or more process/responsibility worksheets.
- Costing or simulating new process options. In some cases design teams will want to compare alternative Could-Be process options with each other or with the current As-Is business process. Or, if the process is new, the team may want to simulate it to learn more about it. This can be very valuable, especially if the process is complex. Simulation often reveals problems that no one notices when simply looking at diagrams. To do costing or simulation, however, the team will have to use a software tool and will need the support of someone who has experience in building cost or simulation models. If the team is already using a tool like IBM's Blueworks or Qualisoft's Qualiware, which are designed to represent To-Be process diagrams and do simulation, it will simply be a matter of entering more specific information about how each of the activities will function. If a spreadsheet is to be used, then the team will want to document the costs and times involved in each activity on an activity cost worksheet.
- Providing detailed documentation of new activities. If specific activities (i.e., jobs, software systems) are being modified or created they should be documented on an activity worksheet. When the team arrives at a fully documented To-Be process design it should arrange to present the proposal to the executive committee, project manager, and steering team. It's important that these groups not only understand the new process but also approve it. These are the senior managers who will have to work to ensure that the new process is actually implemented. A lukewarm approval from senior management is a recipe for a failed implementation phase.

Outcome

The outcome of this phase is documentation describing the new process and management structure that the design team proposes. This design will probably not be in enough detail to satisfy the requirements of software developers or of job analysts, but it should be sufficient to convey to business managers the exact changes that are being proposed. The redesign plan should be approved by senior managers.

Phase 4: Implement Redesigned Process

The goal of this phase is to acquire the space and resources, create the job descriptions, train employees, set up management systems, and create and test the software systems needed to implement the new process.

The work of this phase is handled in a variety of different ways. In some cases the design team is sophisticated enough to continue to refine the To-Be process diagram into a detailed software requirements document that can guide software developers. In other cases the design team that created the To-Be process diagram and the activities worksheets will hand their work over to a new team that will develop specific software requirements. Similarly, the original design team may undertake the creation of new job descriptions, salary and incentive structures, and so forth. In most cases, however, they will pass their design on to specialists in the HR group for detailed specification.

Major Activities

Figure 13.6 provides an overview of the activities in Phase 4. As Figure 13.6 suggests, Phase 4 involves additional participants in the new process development effort. Although representatives of IT have probably been involved in the earlier phases, at this point they will shift and become active on IT software development teams if new software applications need to be created. Similarly, HR specialists will probably work with other human performance specialists to redesign jobs and provide needed training if new jobs need to be created or if new skills need to be provided for those already working on the process being redesigned.

The managers on the process redesign team, working with others in their various functional areas, should refine the management systems, managerial job descriptions, and measures required to ensure that all managers involved with the new process will understand the changes required and the new criteria by which their performance will be judged.

Various groups will test their work individually, and then if it's a large process it will probably be given some kind of field trial to ensure all the pieces work together before the new process completely replaces the old.

This phase varies in length, depending on the nature of the changes that were selected during the redesign phase. It also varies because different specialized groups may become involved in this phase. Thus this phase usually begins with the development of a new plan by the steering team, working in conjunction with the various groups that will actually develop the infrastructure needed to implement the new process.

In a typical case IT people will be engaged to create or acquire new software to implement activities in the new process that are to be automated. In the course

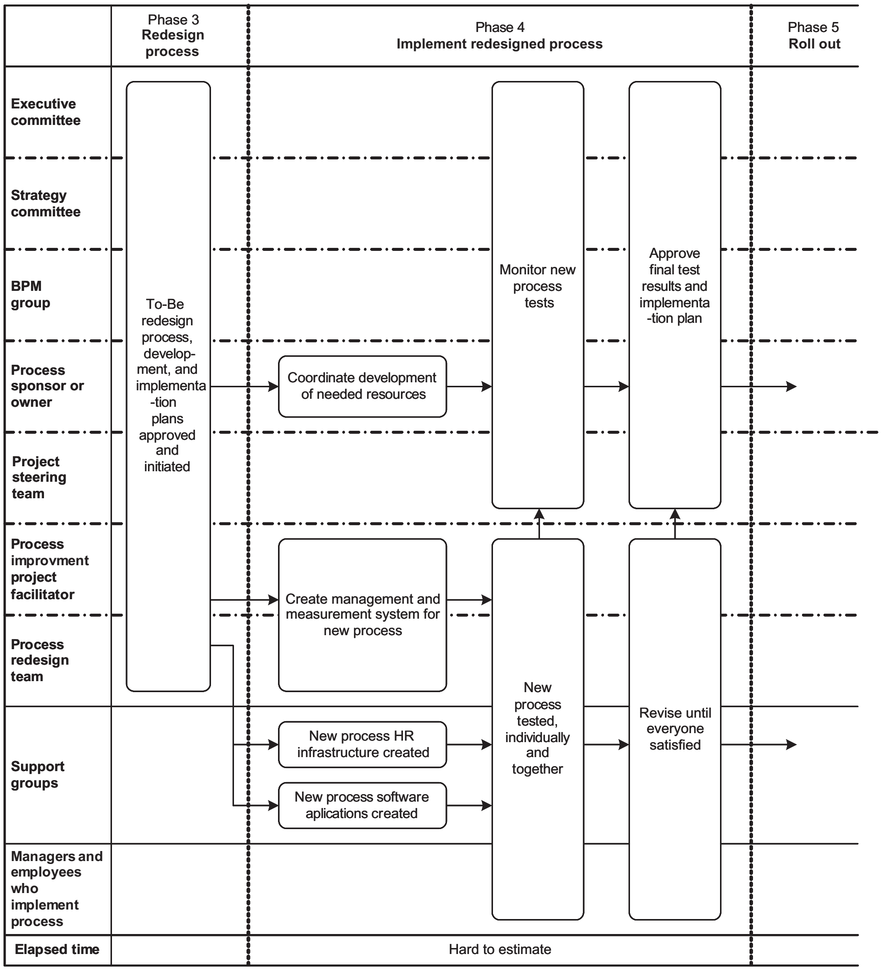

FIGURE 13.6

Overview of major activities in Phase 4 of a redesign effort.

of this activity they will probably need to refine the To-Be process diagrams to create more detailed workflow models, use case models, and any of a variety of other software diagrams, depending on the nature of the software application to be developed.

HR people will be engaged to create new or modified job descriptions and to negotiate needed changes with unions and existing employees. Training people will develop materials necessary to train employees to perform new tasks. In the course of their work human performance analysts will probably develop job diagrams and prepare job analysis worksheets. (See Chapter 6 for a discussion of how HR might follow up the work of the process redesign team.)

In a similar way, if changes in offices or factories are required, logistics teams may be involved to acquire or reconfigure space for the new project.

During this same period the managers involved in the effort should create or refine their management system. If the company is already organized around processes, and the process team is headed by the manager for the process being redesigned, then it will be much easier. In this case it is a matter of refining how the process management team functions and checking all existing goals and measures to ensure that they conform with changes in the process. If, on the other hand, the company is not organized around processes this is the point at which they ought to consider doing so. Obviously, a shift in the management of the organization will need to involve the executive committee and cannot be undertaken lightly. A project manager will need to be appointed. Managers currently reporting to department heads will need to be reoriented to become members of the process team and to report to the process manager. Goals, measures, and incentive systems will need to be renegotiated. Some measures and incentives may continue to flow from the department structure, but most should be tied to the overall performance of the process. If a company is really converting to process management this can easily become a redesign project in its own right.

The alternative—to redesign a process and then leave subprocess managers responsible to department heads and not to an overall process manager—is a recipe for failure. In spite of the redesign, departmental managers will tend to manage to achieve goals chosen for departments and not for the process, and silo thinking will tend to reinsert gaps and disconnects where information and materials are passed between departmental units.

Outcome

This phase ends when the various groups developing infrastructure and resource materials needed to implement the new process have completed their work and tested their materials.

Phase 5: Roll Out the Redesigned Process

The goal of this phase is to transition to the new process. Many companies have redesigned processes and then failed to actually roll them out. This occurs for a variety of reasons. The foremost reason is that senior managers resist the change. Even managers who recognize that the old process is defective may be unwilling to endure the hassles and problems that changing to the new process will entail. Functional managers may not want to make seemingly minor changes in the way things are done within a department to support the goals of a process that's largely outside the focus of the department. Similarly, employees may resist using the new procedures or the new software systems.

The process sponsor and the steering team should plan for the transition. They should work with senior executives to ensure that they have the "push" they will need to get all the relevant managers to try the new process. They should work with middle managers and employees to convince them of the advantages of the new process. In many cases salaries and incentive systems will need to be changed to ensure that managers and employees are rewarded for implementing the new procedures. And they should work with managers responsible for the process at all levels to ensure that they have management plans in place so that they can measure the success of the new process.

Major Activities

Figure 13.7 provides an overview of what takes place in Phase 5. Few people like change. We all rely on habitual behaviors to make our tasks easier, and change upsets all that. Major changes, in which some employees are laid off and others need to

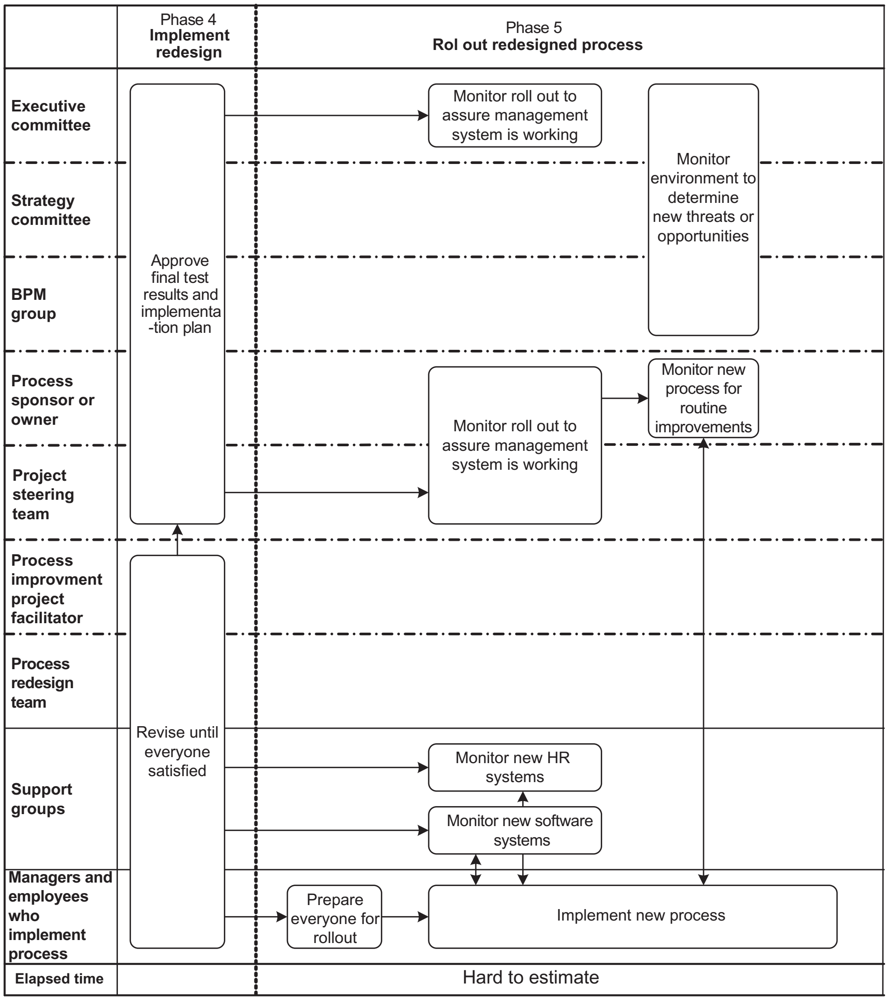

FIGURE 13.7

Major activities in Phase 5 of a process redesign project.

learn to use new software systems, result in even more dissatisfaction. If employees, supervisors, and managers don't see the reason for the change, it's much worse. Thus a good transition plan calls for meetings that acquaint everyone involved with the nature of the change and the reasons for it.

It also requires managerial pressure to ensure there is no backsliding. Senior managers on the project steering team need to communicate their support for the change to the managers below them. The new management system needs to provide ways for senior managers to measure the results of the change, and everyone needs to understand that those measures will be carefully watched to make sure the new process works as designed.

If the change is extensive, then individuals need to be designated so that anyone having problems can get in contact with someone who can deal with the problem. Senior managers should follow up their initial meetings with subsequent meetings to let everyone know that the desired new results are being obtained and that management appreciates everyone's effort.

The activities of this phase vary greatly according to the nature of the new process, the amount of change required, management support, and the resistance offered by those currently performing the process. In many cases the work of this phase will be subcontracted to a team of change management specialists.

If the organization has used a Business Process Management Software tool that not only models but monitors process activities on an ongoing basis, then the manager and others involved in the process rollout will want to take advantage of the tool's capabilities to monitor the process as it is used and perhaps to modify activities to assure that the process meets its targets and goals.

Outcome

The outcome of this phase is a new process. Beyond the transition, managers will need to work to ensure that the new process meets its goals and to identify new problems that will require subsequent changes. Maintaining a process is a full-time management job.

Agile Methodologies

In this chapter we have described a detailed, step-by-step process redesign methodology. The methodology was designed to be comprehensive, in the sense that we intended to introduce practitioners to most of the concepts and techniques that you might use in a large-scale redesign project. In most actual redesign efforts you will only find yourself using a subset of the processes we have described. Some redesign projects will call for automation and some will not. Some will involve decision making and will involve using business rules and others will not. Our goal here is to assure that you would have a large toolbox and a good idea of when various tools might be appropriately used.

In addition to being comprehensive our methodology is designed as a top-down methodology. We begin by considering all the things that we might do to improve an organization's performance. We often begin by looking at a value chain and asking where within the value chain we can make changes that will have the largest impact on the organization.

An alternative approach is to start with a specific process that is broken, often a low-level process than can be easily understood. This approach is often termed a bottom-up approach. Methodologies like Lean and Six Sigma are often used in this way. Small teams are trained in these methodologies and then asked to improve processes within their own workgroups or business units.

Still another approach, which is also often associated with Lean or Six Sigma, is termed *Agile BPM*. The current popularity of Agile approaches derives from work done by software developers in the late 1980s and early 1990s. Earlier, software developers often used large-scale, top-down software development methodologies that required developers to work through a complex series of steps in order. This approach worked well for very large projects and for the software languages used in earlier times (e.g., for corporate accounting applications), but didn't work nearly so well as software developers started to develop smaller software applications (e.g., for an app to run on a smartphone) written in a modern programming language.

The software people who developed the first Agile software development methodologies emphasized the following ideas:

- Develop the application in modules.
- Complete each module independently of others.
- Try to organize your work so that you can execute and test a module at the end of each week.
- Develop an approximation of what you want to create and then extend it to be better.
- Work in small teams so that everyone knows what's going on.

In the decades since Agile programming became popular, people have used the term more broadly and in some cases indiscriminately. Sometimes you read articles that suggest that every organization ought to be agile, and reading between the lines you realize that all they are saying is that organizations ought to be as flexible as needed and respond to changes as quickly as they can—a truism everyone can endorse.

Applied to process work Agile usually refers to bottom-up approaches where small teams work on small projects limited to a few activities. There's nothing wrong with such an approach, although it's better for improving existing processes and it's not very good for responding to major transformations.

Consider Figure 13.8, which pictures a matrix. Along the horizontal axis we list the steps in a process methodology like the one we have described above. Along the vertical axis we indicate iterations each done one after the other. A team considers the process redesign being considered and asks itself what a first approximation of the solution might look like. What simple first approximation would allow the client to get a good idea of the changes the team might implement? Ideally, a first approximation could be done in a week or two at most. The team then proceeds to undertake the first implementation and roll it out. The team works with the clients to determine if the first implementation is a move in the right direction. Assuming it is the team then proceeds to do another round, adding features to improve the initial implementation. Again, the goal is to complete the second round in a week or two at the most. This process continues with small steps undertaken by a

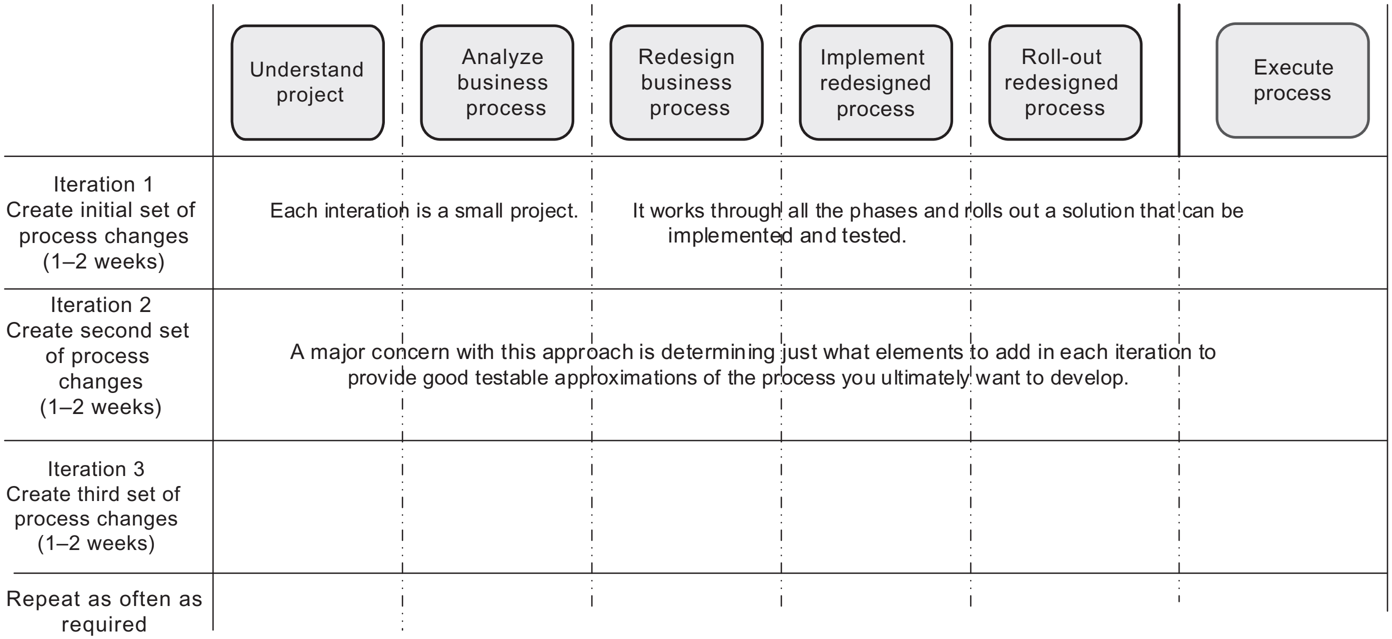

FIGURE 13.8

Improving a process by successive iterations.

small team. Each implementation is completed, rolled out, and tested with clients to assure things are moving in the right direction. Then another round takes place until everyone is satisfied that the process has been improved as much as possible.

Another use of Agile, when applied to process work, involves doing the work via a single iteration, but omitting as much complexity as you can by using very smart tools. In the 1980s and in early business process reengineering efforts it was common to create process diagrams that listed every single activity that occurred in very large processes. Thus a flow diagram of an auto production line process might cover a large wall with diagrams. Most of the activities shown in the diagrams didn't need to be changed. Some project efforts got lost in the analysis effort, kept diagramming more subprocesses and defining steps within tasks, and never seemed to get around to actually redesigning the process. In a similar way, we have seen teams begin by trying to enumerate corporate goals or competencies, argue about how many competencies they need, and never get down to figuring out how to create a useful process.

We suggest creating stakeholder diagrams and then turning them into process scorecards. Done correctly, with a balanced emphasis on satisfying management and customer stakeholders, this approach can quickly generate the goals for an organization and show how they link to specific value chains and subprocesses within. Similarly, we recommend using scope diagrams before thinking about doing process flow diagrams. A scope diagram, done in a group with appropriate managers and employees, can quickly identify the major problems a process has. Then we recommend simply drilling down and making flow diagrams for the specific problems identified in the scope diagram. Don't waste time with comprehensive flowcharts. Diagram only the specific subprocesses or activities you need to understand to make changes to improve the performance of the process.

Don't think that you need to use all of the techniques we have described. Create a small process improvement team, create a simple process diagram to establish boundaries, do a stakeholder diagram and then a scope diagram, and then decide what else you need to do. You can create your own agile approach simply by using this methodology as a suggested approach rather than a required set of steps. Be agile and create your own business process methodology as you go to reflect the needs of the situation you face.

Summary

By way of a quick summary the major phases in a process redesign project include:

- Phase 1: Understand Project
- Phase 2: Analyze Process
- Phase 3: Redesign Process
- Phase 4: Implement Redesigned Process
- Phase 5: Roll Out Redesigned Process

Figure 13.9 provides a slightly different way of looking at a process redesign project. In this case we have listed the phases as a series of boxes. Within each box we have listed the key objective and the major steps in each phase. We have also listed

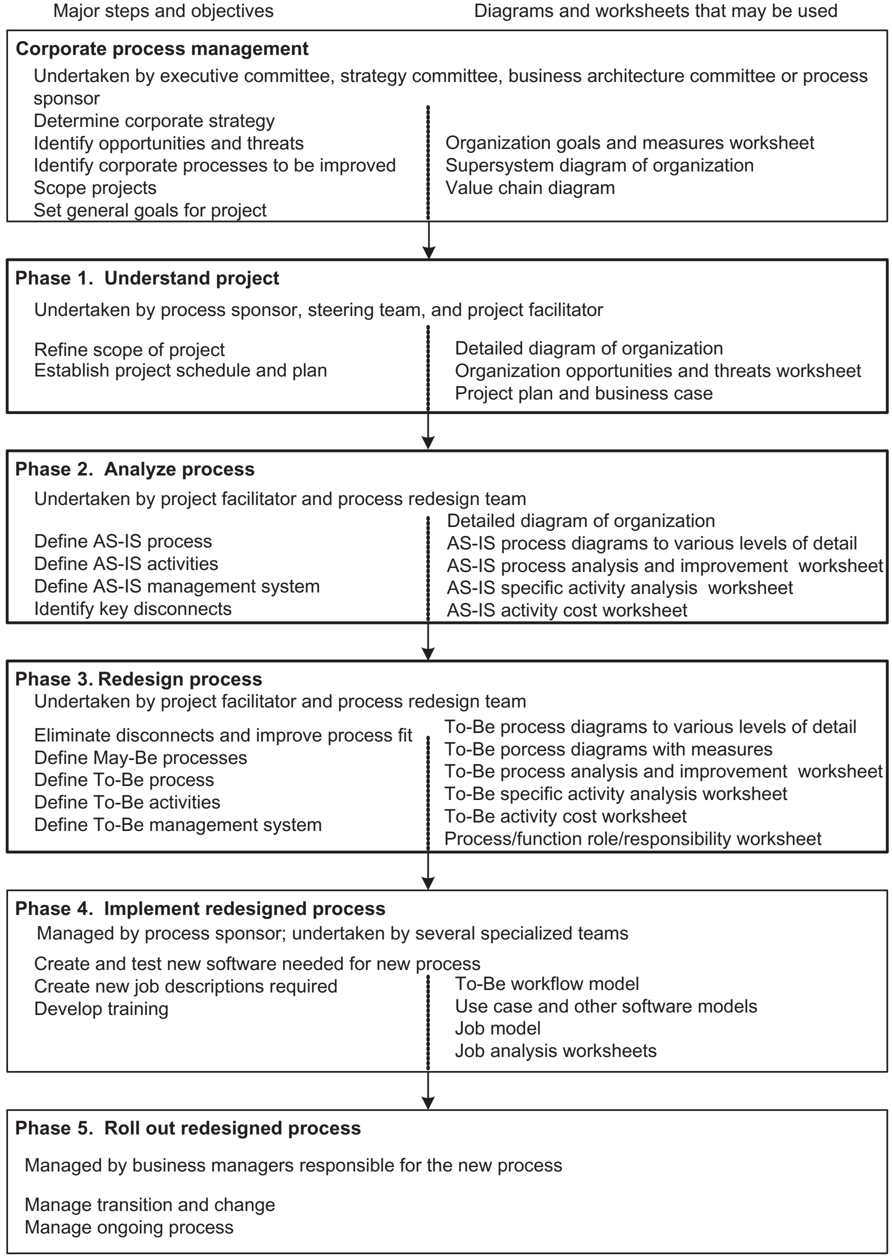

FIGURE 13.9

Overview of process redesign.

the diagrams and the worksheets used in each phase. We have already described the various diagrams in earlier chapters. We will provide examples of the worksheets in later chapters. We mention them here to lay the groundwork for their use in the case study. In most cases companies won't use worksheets, and we provide them only as a way of showing the kind of information that a company needs to gather and the decisions that should be documented.

This overview cannot begin to provide detailed information about what should happen in each phase of a redesign project. Hopefully, however, it provides an introduction, and it should become clearer as we consider a detailed case study in Chapter 16.

Notes and References

Once again, many of the ideas incorporated in the BPTrends methodology are derived from conversations Roger Burlton and I have had. Other ideas derived from discussions with Geary Rummler.

There are many good books that describe redesign methodologies in more detail. Six of the best are:

Mahal, Artie, *How Work Gets Done*, Technics Publications, 2010. A very gentle introduction to the BPTrends methodology with lots of practical advice.

Jeston, John, and Johan Nelis, *Business Process Management: Practical Guidelines to Successful Implementations*, Elsevier, 2006. A new methodology book that provides considerable detail.

Manganelli, Raymond L., and Mark M. Klein, *The Reengineering Handbook: A Step-by-Step Guide to Business Transformation*, American Management Association, 1994. Lots of practical advice and a step-by-step methodology.

Kubeck, Lynn C., *Techniques for Business Process Redesign: Tying It All Together*, Wiley-QED, 1995. Another good book with information on phases and what has to happen when.

Petrozzo, Daniel P., and John C. Stepper, *Successful Reengineering*, Van Nostrand Reinhold, 1994. Another good summary of successful practices.

Grover, Varun, and William J. Kettinger (Eds.), *Business Process Change: Reengineering Concepts, Methods and Technologies*, Idea Group Publishing, 1995. A book of readings. Some of the chapters are excellent and provide information on specific techniques.

There are a number of good books on facilitation. My particular favorite is:

Bens, Ingrid, *Facilitation at a Glance!: A Pocket Guide of Tools and Techniques for Effective Meeting Facilitation*, GOLA/QPC, 1999. This pocket book pulls many techniques together.

Two good articles on Agile methods include:

Rigby, Darrell K., Jeff Sutherland, and Hirotaka Takeuchi, "Embracing Agile," *Harvard Business Review*, May 2016.

Rigby, Darrell K., Jeff Sutherland, and Andy Noble, "Agile at Scale," *Harvard Business Review*, May–June 2018.

CHAPTER

Rental Cars-R-Us case study

14

The Rental Cars-R-Us case study is hypothetical. We did not want to describe problems associated with any specific client. At the same time we wanted a case that would give us an opportunity to cover the full range of process redesign techniques we have discussed in this part of the book. Thus we created a case study that blends the characteristics and problems faced by several companies we have worked with in the past several years. (We have never worked with a rental car company.) Similarly, we show diagrams and worksheets, although in almost all cases, when we work with actual clients, we use process modeling software tools and document our results with the tool. With those qualifications we have tried to make the case study as realistic as possible so that readers will get a good idea of the problems they will face when they seek to implement the concepts and techniques we have described.

Rental Cars-R-Us

Rental Cars-R-Us is a small car company, established initially in Vancouver, British Columbia, Canada. In the past 2 years, it has been acquiring other car companies in Western Canada and the United States and growing larger. Senior management is largely focused on acquisitions, franchising, and finance, but the COO is concerned with the fact that quality and consistency have decreased as the organization has grown.

There are many types of redesign projects that a company can undertake. Some involve the creation of new processes or the transformation of an existing process into some radically new process. This is not what is being asked for here. The company has a car rental process and is happy with the overall result. What it wants, instead, is for the process to be more consistent and to be smoother. So, rather than beginning with a goal of completely changing the process, we begin with the goal of making an existing process smoother and more efficient. We do not begin with a specific change in mind, but rather begin with a broad examination to determine where there are opportunities for improvement.

Rental Cars-R-Us rents cars to its customers. Customers may be individuals or companies. Different models of cars are offered and organized into groups. All cars in a group are charged at the same rates. A car may be rented by a booking made in advance or by a "walk-in" customer who simply shows up and wants to rent a car. A rental booking specifies the car group required, the start and end dates/times of the

Business Process Change. https://doi.org/10.1016/B978-0-12-815847-0.00014-5

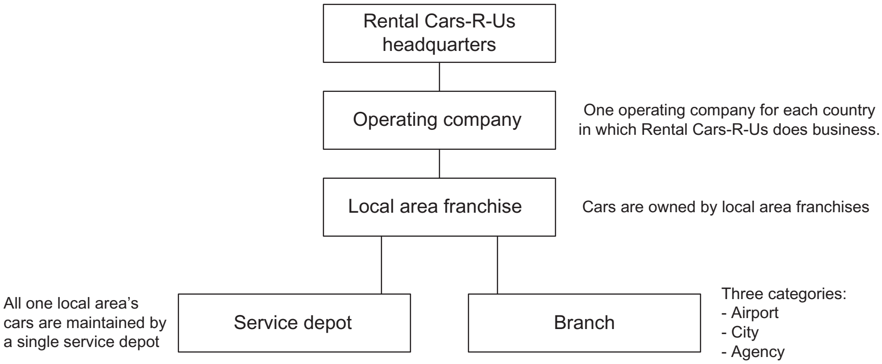

FIGURE 14.1

Overview of the organization of Rental Cars-R-Us.

rental, and the rental branch from which the rental is to start. Optionally, the reservation may specify a one-way rental (in which the car is returned to a branch different from the pickup branch) and may request a specific car model within the required group.

The overall organization of Rental Cars-R-Us is described in the organization chart shown in Figure 14.1.

Phase 1: Understand the Project

The business process management (BPM) redesign team was established by Steve La Tour, the COO, who resides in the corporate headquarters in Vancouver. Steve is interested in what he can do to standardize practices and improve quality in all the franchise groups that the corporation deals with. Without going into details a team of seven people, including business analysts, an HR performance specialist, and an IT developer, has been assembled and placed under the direction of Mary Mahal, who is to serve as the BPM team project manager. At this point Steve, Mary, and the team are trying to establish what they will attempt to achieve in their first project.

Trying to come up with an initial description of the scope of the problem is a bit tricky because the organization has layers and manages different processes at different organizations. At the same time it is a nice illustration of the power-of-process approach. Figure 14.2 shows a simple architecture of the core, management, and support processes that the BPM redesign team worked out with Steve La Tour when they met for the second time.

There are two value chains: one that acquires customers and rents cars to them and another that establishes franchise car rental companies. In Figure 14.2 we have divided the acquire-and-rent value chain into two major streams, one focused on acquiring customers and one focused on renting cars to customers who request the service, primarily to reflect the fact that the corporate group runs the first and the

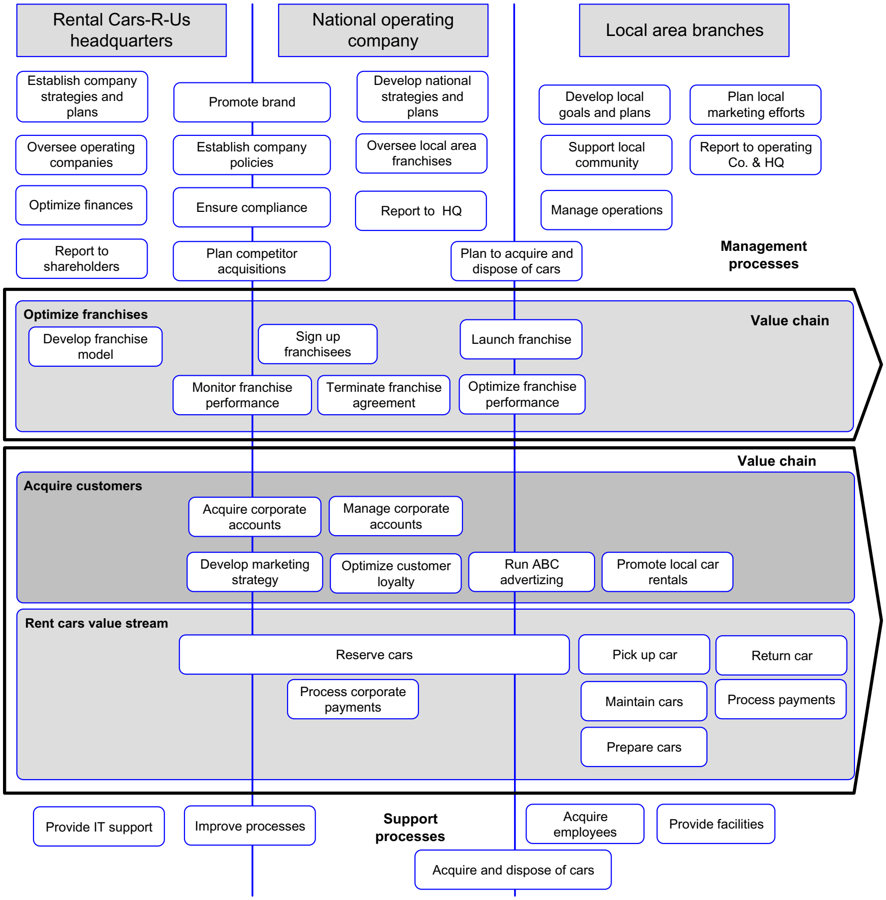

FIGURE 14.2

Quick overview of where some of the Rental Cars-R-Us processes occurred.

franchise groups run the second. There are management processes at the corporate, operating, and local level, and there are support processes at each level as well.

The process improvement effort began when Steve La Tour asked the BPM redesign team to study one local area franchise in Calgary, Alberta, Canada. To develop a concrete understanding of the problem the process redesign team refined the task even more, and decided to focus on the airport branch of the Calgary franchise, which is one of the largest Rental Cars-R-Us branches and one that gets many complaints.

As the process redesign team pointed out, however, the overall process of renting cars was not confined to the branch and included subprocesses that occurred at the corporate HQ and at the local branch. For example, reservations were taken at a Canadian call center and then entered into a computer maintained at corporate HQ.

Once a reservation is made the local franchise is notified and the information is made available on the database that franchise people can access. Looking at the architecture that the process redesign team had sketched Mr. La Tour asked the the team to focus on the *rent cars* process, at the Calgary airport.

After visiting the Calgary site the process redesign team created Figure 14.3 to show the basic management organization at the local franchise branch offices.

At the same time the team sketched out the diagram in Figure 14.4 to show the value stream—*rent cars*—that the team decided to focus on. The team decided that the process was triggered by a request for a car, however the request originated, and concluded when the rented car had been returned and paid for, ensuring that the transaction could then be closed.

Once everyone agreed that *rent cars* was the process the redesign team was going to focus on the process redesign team interviewed managers and employees at the Calgary branch and proceeded to create a stakeholder diagram for the *rent cars* process (or value stream), which is pictured in Figure 14.5. The stakeholder diagram pictures all the individuals, groups, systems, or processes that have a major interest in whether the *rent cars* process works as it should. Usually, the major

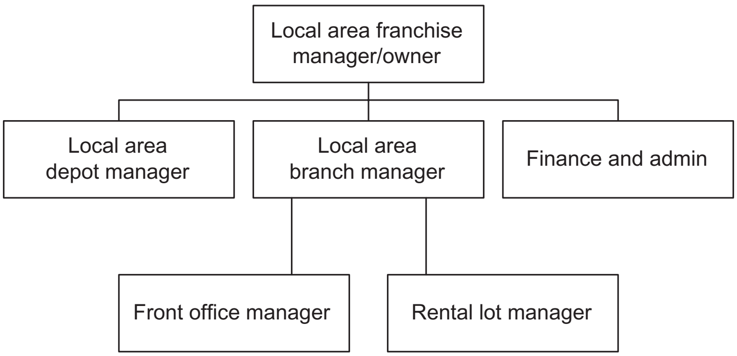

FIGURE 14.3

Organization chart of the Calgary Local Area Franchise.

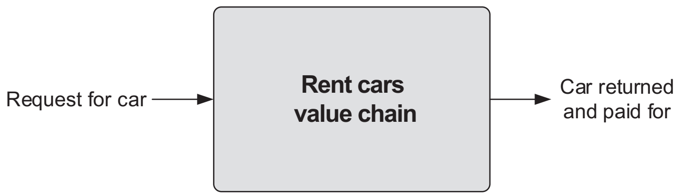

FIGURE 14.4

Simple overview of the *rent cars* value chain.

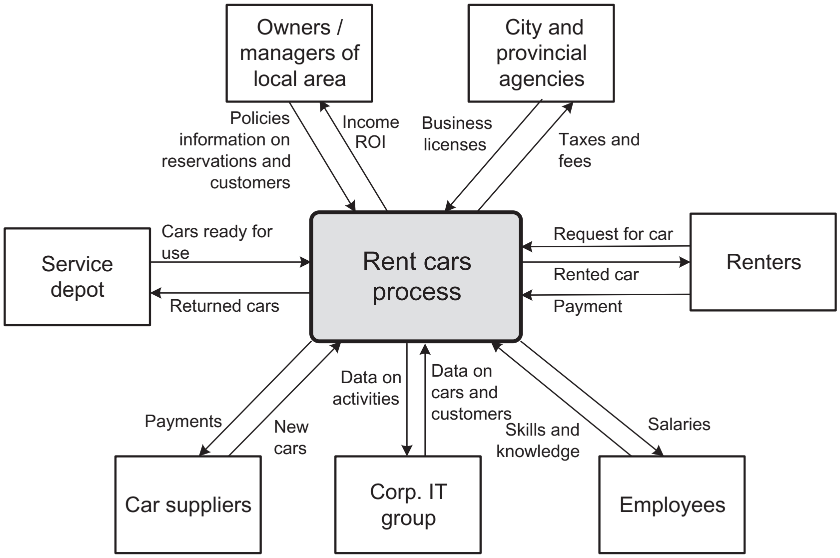

FIGURE 14.5

Stakeholder diagram for the *rent cars* value chain.

stakeholder is the customer—in this case the person who rents a car—but other stakeholders are also important and should not be overlooked. Management, for example, is a major stakeholder, vitally interested in the costs and the profits of the rental car franchise. (The management of the overall company is not a stakeholder in the *rent cars* process as such, but rather a stakeholder in the franchise itself.) A good stakeholder diagram ensures that the team is thinking about all the people the process will need to support.

As soon as the team completed the stakeholder diagram they proceeded to develop a worksheet on which they listed how each of the stakeholders would judge the success of the *rent cars* process. The customer, for example, wanted a car on time and in perfect condition with minimal hassle getting the car and checking it back in. Tax agencies wanted accurate reports and payments on time. Similarly, the owners and managers of the franchise operation (management) wanted accurate financial reports, a good return on their investment, and compliance with corporate policies and local rules. (The local managers in turn were responsible for reports and cashflow to the corporate management organization.) In essence, the collected concerns of the stakeholders provided the BPM team with a clear statement of the goals by which the overall success of the process might be judged.

Figure 14.6 shows a portion of the stakeholder scorecard that the process team developed for the specific franchise unit that managed the *rent cars* process. In conjunction with the management group responsible for company strategy and goals they developed another scorecard for the HQ group. This corporate

Business process scorecard			
Project:		Analyst:	
Organization-in-scope XYZ car rental branch		Process in scope: Rent car process	
Stakeholder	**What does the stakeholder give to or get from the process?**	**Why does the stakeholder care if the process works or not?**	**What are the KPIs and targets for the stakeholder?**
Customers (renters of cars)	Customer pays to rent car and expects a clean car, ready to go when he/she arrives	Customer depends on car to continue journey	No customer complaints Repeat business
Management (of branch)	Management funds and plans, organizes and controls process. Management expects to generate income/profit from process	Management livelihood depends on success of the process	Weekly, monthly income Weekly, monthly profit Growth in customers, income and profits No legal or personnel problems
City and provincial agencies	Agencies responsible for enforcing laws. They want the process (business) to run according to appropriate regulations	Agency is judged by their ability to regulate businesses and collect appropriate taxes	No infractions of rules Taxes and fees paid in full and on time
Employees	Employees depend on work on process (for business) for income, benefits, daily work experiences and possible advancement	Employee depends on process to generate his/her income, benefits, pleasant work environment and, perhaps a career path	No complaints from employees Low turnover Employees paid on time Benefits paid on time
Etc.			

FIGURE 14.6

Partial process scorecard for the franchise-based *rent cars* process.

management scorecard was later elaborated into a full-scale management tool for measuring the company's success. In the meantime the franchise scorecard served as a source of measures to determine the success of the process improvement effort.

Next, the BPM team developed a scope diagram describing the *rent cars* process. They developed this diagram with a team of managers and employees from the Calgary franchise. Working with a whiteboard the group discussed all the interactions between the *rent cars* process and its surrounding environment. They considered individuals and organizations that interacted with the process. They also considered other processes and systems that interacted with the process. The team began by discussing inputs and outputs. They identified the nature of the input or output—telephone calls, reports, over-the-counter requests—and who originated the input or received the output. Then they considered interactions that constrained the process in one way or another—policy statements issued by corporate HQ, rules in employee manuals, or legal requirements issued by various agencies. They also considered all the resources used each time the process was executed, such as employees, facilities, databases, or software applications. Figure 14.7 shows the initial scope diagram they came up with.

After developing the initial scope diagram the team considered each interaction. They asked if it was acceptable as it was, if it could use some improvement, or if it was a real problem that had to be fixed. Several problems had been uncovered in interviews. Policies were unclear or confusing and thus clerks taking reservations on the telephone often made mistakes in completing the reservation screens. These

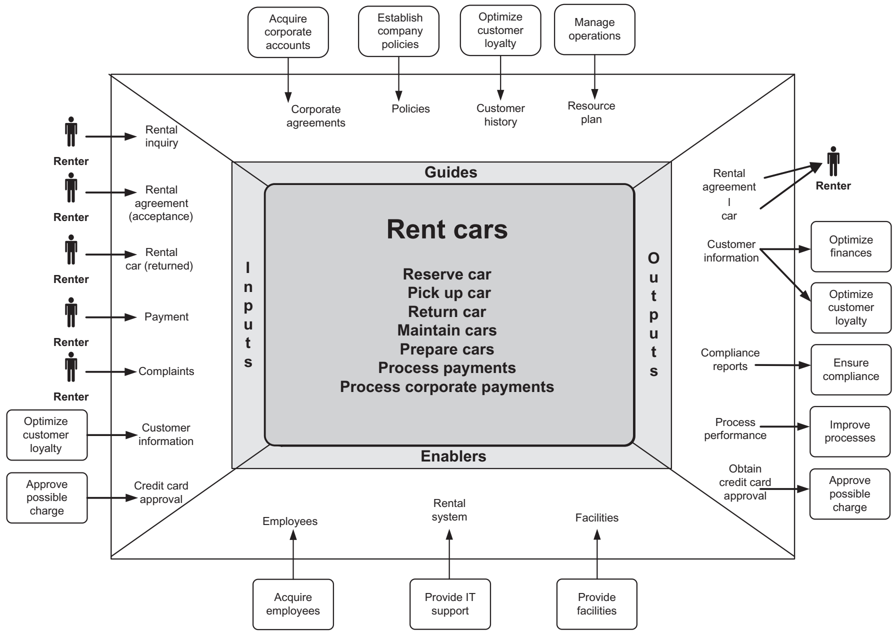

FIGURE 14.7

Initial scope diagram of the *rent cars* value chain.

mistakes were usually caught when renters arrived to pick up the cars, but customers still complained about the time spent revising the reservation information. Some problems slipped through, and subsequently HQ legal or finance staff sent formal complaints to local area management about incorrect reservations that put company insurance at risk. The local area staff, however, thought headquarters should make policies clearer and should program the rental system to reject reservations made incorrectly.

Problems also occurred in car setups. Occasionally, customers arrived to find their car was not set up right. A car might not have a global positioning system as ordered, or a car might be logged into the wrong slot on the lot, so a customer could not find it. Sometimes, the general maintenance of the cars was not as good as it could have been—a paper cup found in the back seat area or the gas tank not full—leading to customer complaints. The depot manager blamed the problems on poor training of the employees who carry out auto maintenance and preparation. Some of these problems—poor setups, for example—were internal problems that would not really get noticed until you looked at a flow diagram focused on the subprocesses within the *rent cars* process.

Clearly, the fact that reservations were often incomplete or inaccurate was a major problem. The process redesign team developed the cause-effect diagram shown in Figure 14.8 to explore the sources of incomplete and inaccurate reservations in more detail.

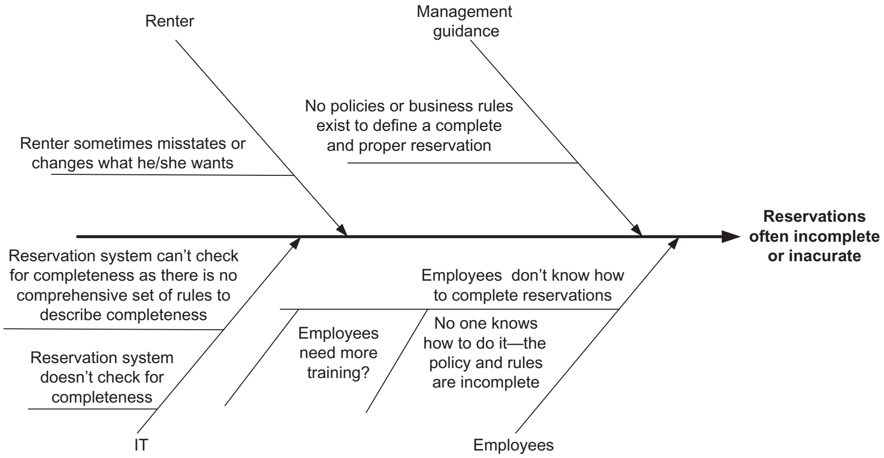

FIGURE 14.8

Cause-effect diagram designed to explore incomplete and inaccurate reservations in more detail.

Figure 14.9 shows a scope diagram that has been annotated to show where problems occur, to indicate the severity of the problems, and to show what external processes might need to be examined during the analysis phase to ensure comprehensive analysis of the major problems.

Figure 14.10 shows the problem analysis worksheet that the process redesign team completed in conjunction with the scope diagram. We normally consider six types of problems. Four of these—*input problems*, *output problems*, *guide or constrain problems*, and *resource or enabler problems*—can be analyzed by means of a scope diagram and the results of the analysis can be entered on the worksheet.

Information about the flow of subprocesses within the *rent car* process and internal management processes will be considered when we turn to a flow diagram that defines the internal activities of the *rent car* process.

Once the scope diagram and the initial problem analysis worksheet were completed the BPM team was in a good position to suggest to management what they would want to study in more detail in the analysis phase of the project. They were also in a good position to suggest to their sponsors what kinds of problems they were looking at and to make some guesses as to what kinds of solutions and what costs might be involved in redesigning the *rent cars* process. Their conclusions were not final at this point, but the team shared them with appropriate personnel simply to engage management in a conversation about the redesign. Good change management requires that people be kept informed and that the team develop a dialog with those whose jobs or activities might be altered. A presentation at the end of the understand phase provided a place to start and suggested where resistance might lie—which in turn helped direct the types of questions the team asked during the second phase.

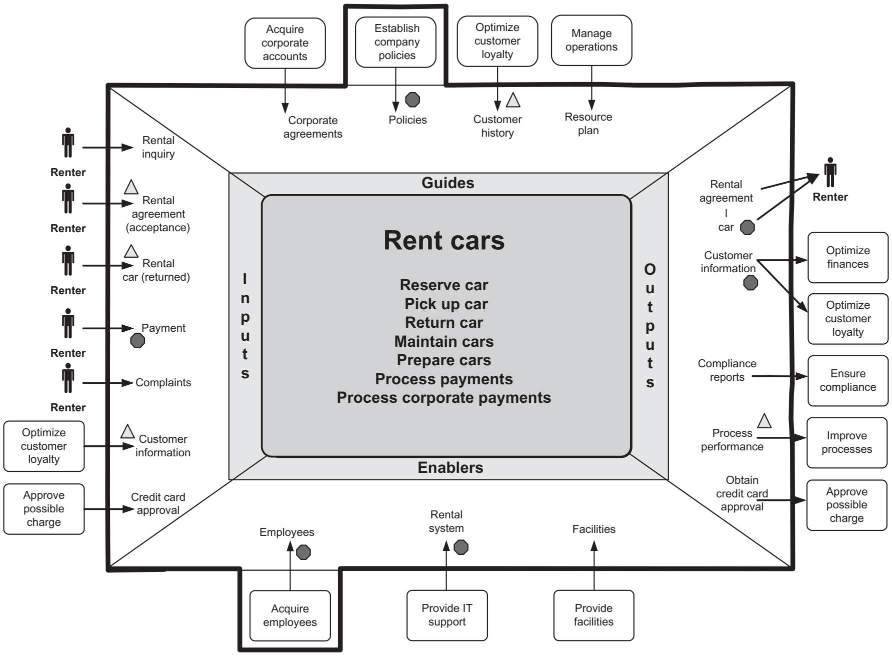

FIGURE 14.9

Scope diagram with problems indicated and a *line* to suggest the project scope.

Problem analysis worksheet				
Process/project: **Rent car**			Analyst:	
Source of problems		Specific example of problems	Impact	How would we know problem is cured? (project measures)
Process flow analysis	Issues with inputs	**Rental agreements sometimes incomplete**	**High**	**No complaints from legal re. incorrect agreements** **No complaints from renters re. changes in agreement**
	Issues with outputs	**Rental agreements sometimes have to be changed**	**Medium**	**No complaints from renters re. changes in agreement**
	Issues with guides	**Policies on certain rental issue unclear or confusing**	**High**	**No complaints from legal re. incorrect agreements** **No complaints from renters re. changes in agreement**
	Issues with support (Including IT, facilities and employees)	**Customer systems allows incorrect rental agreements** **Employees not trained to prepare cars correctly?**	**High** **Medium**	**No complaints from legal re. incorrect agreements** **No complaints from renters re. changes in agreement** **No complaints from branch lot re. cars not correct** **No complaints from customers re. cars not correct**
Process flow analysis	Issues with subprocesses and flows			
	Issues with process management			

(Impact: High, medium, low)

FIGURE 14.10

Problem analysis worksheet for *rent cars* process.

Phase 2: Analyze the Business Process

In the initial phase the team seeks an overview and tries to define issues they need to explore in more detail. In essence, during the second phase the team gathers data to really understand why the problems identified by the scope diagram existed and to define how serious the problems really are.

As a generalization, when one switches from the understand phase to the analysis phase one shifts from looking at how the process interacts with its environment and begins to explore why the process functions as it does. We shift, in other words, from asking what the process is doing to asking why it is doing what it is doing. At the same time we shift from a scope diagram to a process flow diagram—which in our case usually means shifting to a Business Process Model and Notation (BPMN) diagram. Figure 14.10 pictures the first flow diagram that the process redesign team developed to try to understand the internal flow of the activities that made up or supported the *rent car* process. We have marked it up to emphasize several things. First, the pool that makes up the core of the BPMN diagram is equivalent to the center of the scope diagram—except that it contains the activities that occur inside the *rent car* process. Processes that occur outside the *rent car* process are shown in swimlanes above or below the rent car process pool. The swimlanes that make up the *rent car* process pool are labeled on the left to show who is responsible for them. Figure 14.11 highlights how we can tie management processes to the organization diagrams of the HQ and franchise operations.

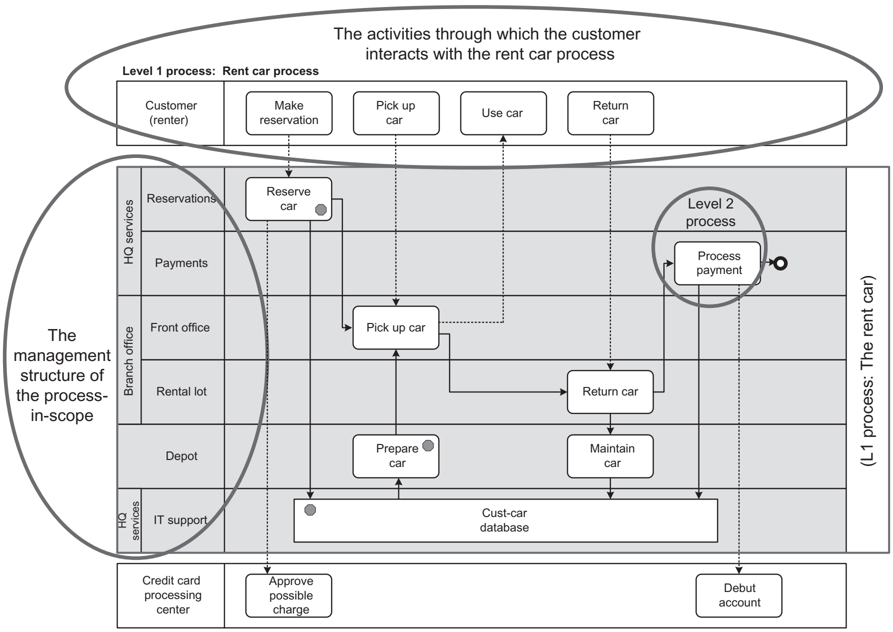

FIGURE 14.11

Some important elements of a Business Process Model and Notation flow diagram.

In essence, when we develop a BPMN flow diagram to depict our *rent car* process we create a new way of looking at our process. We look inside the process we considered in the scope diagram to see how the process deals with the external inputs and outputs we considered in that diagram. Let's shift our focus and and try to answer three questions: What activities make up the *rent car* process? How do activity flows pass from one activity to another? Who is responsible for managing each activity? In addition, we continue to consider some interactions between the *rent car* process and its external environment. If we place a customer swimlane above the *rent car* pool, then we can examine all the interactions between the *rent car* process and the customer. This is an important consideration if we are focused on how to improve customer-process interactions. In a similar way, we can place one or more suppliers or partners in swimlanes below the *rent car* process to allow us to show the details of those interactions.

Sometimes, when we initially draft our first BPMN diagram we place all the Level 2 processes inside a single swimlane (a pool) and just focus on getting the basic flow worked out. Later we usually divide the pool into several swimlanes to show which functional units, departments, roles, or specific managers are responsible for each of the activities. In an ideal world we should be able to trace our swimlane titles to the managers on the organization chart (Figure 14.12).

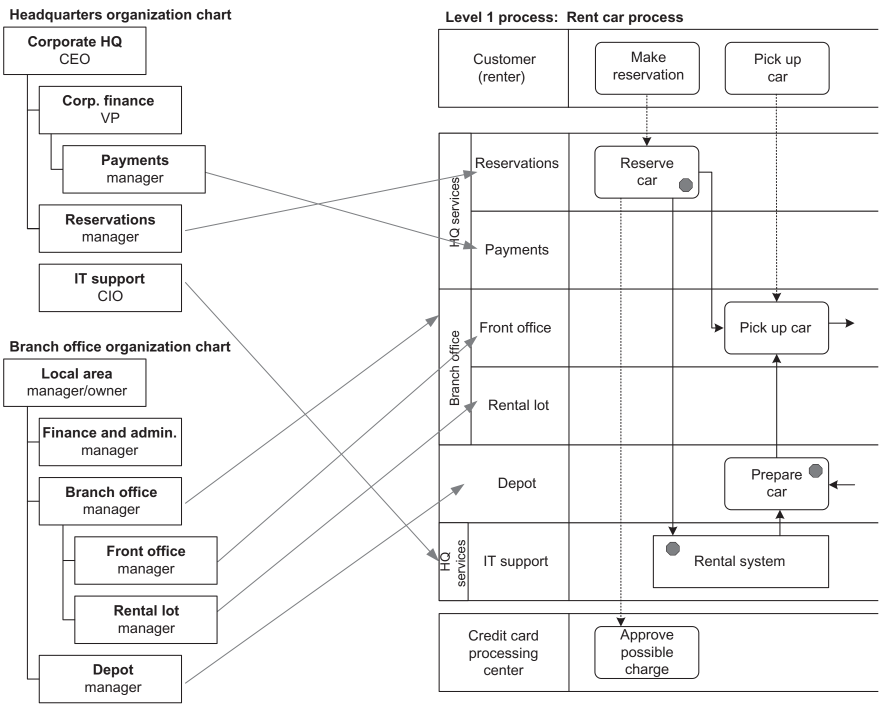

FIGURE 14.12

Initial high-level As-Is flow diagram should reflect existing units within the organization that are responsible for the various activities in the process.

Finally, we transfer information from our scope diagram to our new BPMN diagram, using red and yellow icons to show where there are serious problems and where there are less serious problems. You will find that some trouble icons should be within activity boxes, whereas others will be better shown on the flow between processes. The key thing is to define the internal flow of the process and highlight the problem areas.

Figure 14.13 highlights a question that process redesign teams always have to consider. What level of detail should you show on any given diagram? Should you show only the default paths or should you also show the exceptions? Should you show responses from systems? There is no correct answer. You should show what makes sense to the people creating and using the diagram, and you should focus on the elements that are important for your purposes. There are no "correct" diagrams—they all simplify the complexity of reality. There are only more or less useful diagrams. If you are trying to figure out the overall order of subprocesses, then it is probably best to skip the exceptions until you are ready to focus on them.

When the BPM redesign team created their initial BPMN diagram to provide an overview of the activities and flow of the *rent cars* process. They also created a worksheet and documented the problems they had encountered. The worksheet listed topics they wanted to learn more about and suggested how they might gather data to help clarify the nature and extent of each possible problem (Figure 14.14).

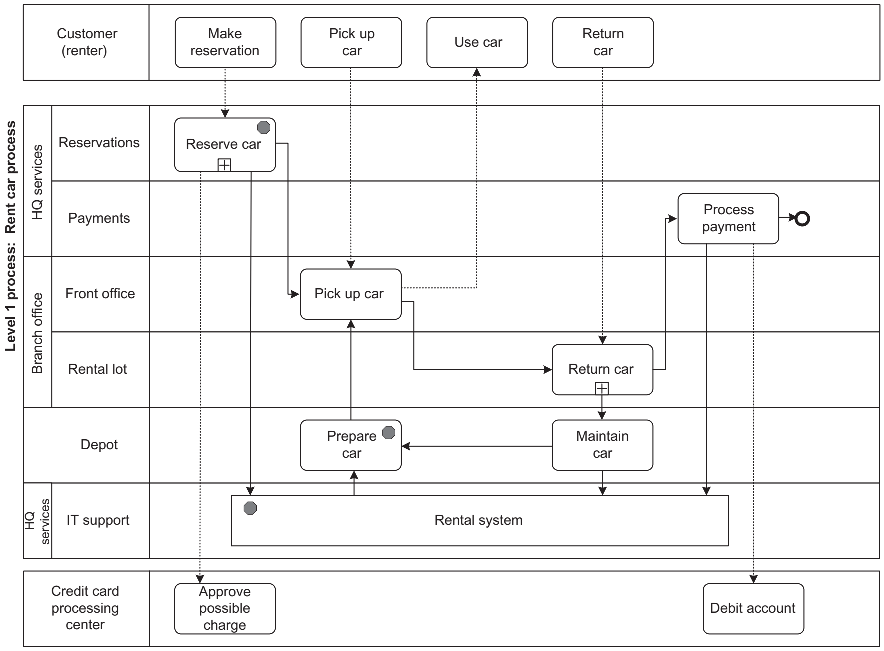

FIGURE 14.13

The initial As-Is flow diagram of the *rent car* process.

Analysis planning worksheet		
Project: **Rent cars redesign project**	Analyst:	
	What do I need to know more about? **Only list problems that are high priority and worth investigating at this time**	**How will I get the needed data?** **Where will I get the data, how often will I get it, how will I get it?**
Issues with inputs	Customer complaints	Tabulate customer complaints. What are the complaints? What activities seem to produce them?
Issues with outputs	Cars sometimes not as desired Rental agreements sometimes have to be changed	Compare initial rental agreements with final agreements. Did customers change when they arrived on lot? Else why were changes made?
Issues with guides	Policies on certain rental issue unclear or confusing	Interview management and examine existing policies. How is a complete reservation defined? Is there any disagreement on this? Do existing paper forms or software interfaces ask all the needed questions? Study a number of reservations. How often do errors occur. Are they random or do particular employees make specfic types of mistakes?
Issues with support (including IT and employees)	Rental agreements sometimes incomplete. Why is this happening? Because employees don't ask. Because the computer system doesn't require? Employees not trained to prepare cars correctly? Customer systems allows incorrect rental agreements Some cars not prepared as desired, or not maintained correctly	Watch employees take reservations. Record exactly what they ask and do. Study the depot operations to see what cars are defective. Gather data on numbers of errors and patterns.
Issues with subprocesses and flows		
Issues with process management	Cars sometimes not as desired Policies on certain rental issue unclear or confusing	What kind of supervision process does depot have in place to assure cars are prepared as they should be? Why hasn't management established clear policies and rules? Are they willing to make the effort required?

FIGURE 14.14

Analysis planning worksheet for the analysis phase of the *rent car* process redesign effort.

There is no one approach to analysis. When we undertook the first phase and created a scope diagram we learned much about the types of problems we might expect as we studied the *rent cars* process from an external perspective. (We defined *input*, *output*, *guide*, and *enabler* problems.) We already have a worksheet that lists some problems and another that lists criteria stakeholders can use to judge the process. Our initial challenge in the analysis phase is to refine our understanding of the problems, and then proceed to diagnose the causes of various internal problems. Specifically, we will want to learn more about the external problems we have already defined, and we will want to look at how the activities, the workflow, and the management of specific activities generate the problems we have already encountered. Later, we will want to determine the salience of each problem to decide how to allocate the time and resources we will expend on fixing various problems.

In some cases a process will have obvious problems and it will be easy to see what should be done. In other cases the problems will be complex, or there will be many interacting problems and it will be harder to decide just exactly what is causing the problems or what changes will give us the biggest improvement for the effort we expend. Assuming our current process is complex and we feel a need to examine the problems from many angles we would probably follow an investigation that considered each of the following:

- What do we ask of the customer?

- What do we actually do, especially when we are generating problems?
- How do employees or automated systems contribute to success or problems?
- Is the process managed effectively?
- Does it all flow smoothly?

All of these issues are discussed in Chapters 9 and 10. Moreover, they are summarized in Appendix 1, where we include a checklist of redesign problems to consider. Now let's consider each point in a little more detail in the context of the *rent car* process.

Start With a Second Look at the Customer Process

Every organization and process team says they want to make customers happy. As we examine how the customer interacts with the process we can begin to imagine changes we might make to simplify what the customer had to go through to rent or return a car. In Figure 14.11 we highlighted the customer process. We already considered this indirectly when we developed our scope diagram, but with a BPMN diagram we can study it in more detail, looking at the actual flow of customer activities, where the customer has to wait, or where he or she might encounter problems. If we want to improve the customer's experience we need to examine exactly what the customer has to go through to interact with our process and then consider how to improve that experience. Obviously, we cannot deal directly with the customer process—it is what the customer does. But we can certainly change the business process to make it easier for the customer to do what he or she has to do, and we can change our process to make it possible for the customer to do things in a different order. Figure 14.15 shows a diagram that pictures what happens when the customer decides to reserve a car. The BPM team worked up several diagrams like this to ensure that they understood exactly what the customer went through as he or she interacted with the company.

Because the team already knew there were problems with the reservation process they examined specific subprocesses in considerable detail. In this case the team developed a scope diagram of the *reserve car* subprocess (Figure 14.16). In developing the new diagram the team kept in mind that the *reserve car* subprocess was contained within the *rent car* process and would therefore use some, but not all, of the *inputs*, *guides*, *outputs*, and *enablers* used by the superprocess.

Figure 14.17 shows another way the process redesign team looked at the *reserve car* process. In this case they considered a variation on the normal reservation process in which a corporate travel office called to make the reservation. In this instance they were focused on what happened when the entity calling for a reservation was a corporate travel office with which Rental Cars-R-Us had an established relationship. Company policy requires Reserve Car employees notify the individual in whose name the car is reserved and thus in this case there are two customers: the entity making the reservation and the customer for whom the reservation is made.

Decisions need to be made concerning the nature of *reserve car* activity. The BPM redesign team considered the policies and specific business rules that had already been defined to analyze and make decisions about car rentals. To define a set

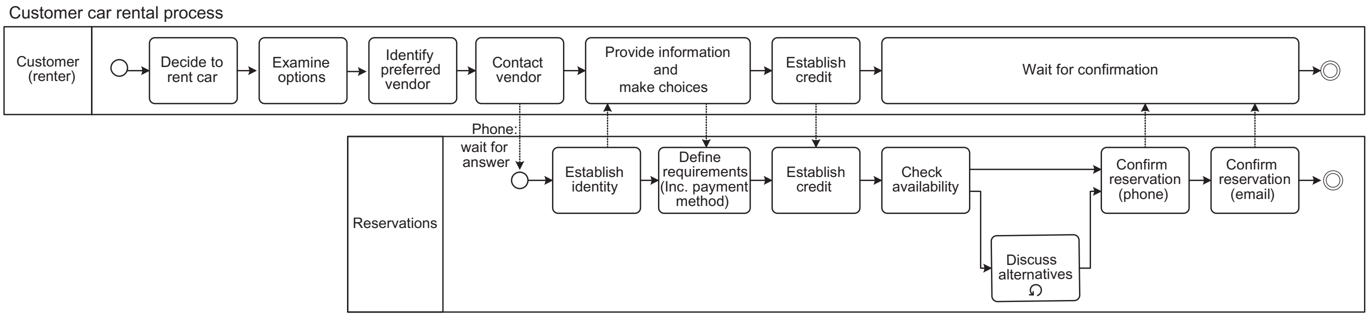

FIGURE 14.15

More detailed look at a customer's car rental process.

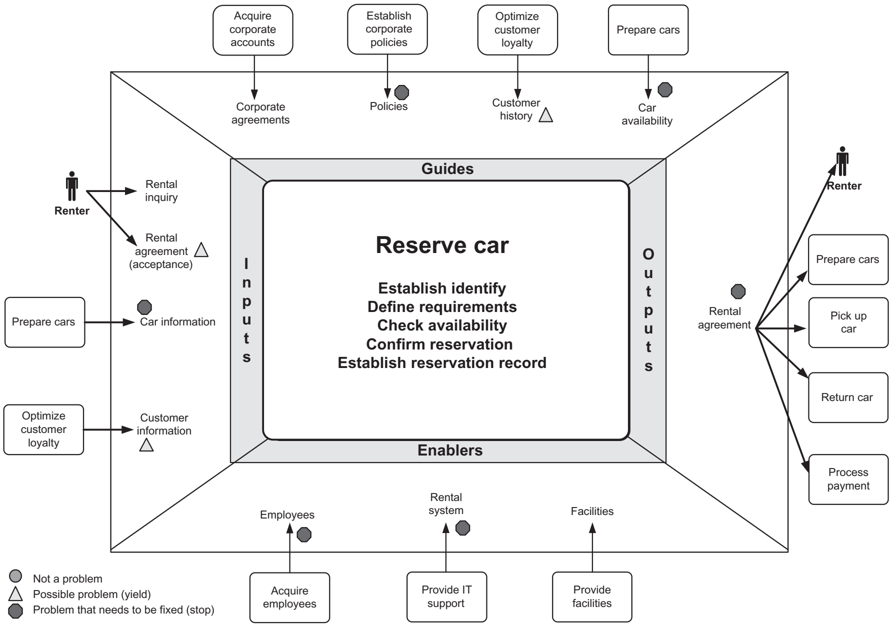

FIGURE 14.16

Scope diagram of the *reserve car* subprocess.

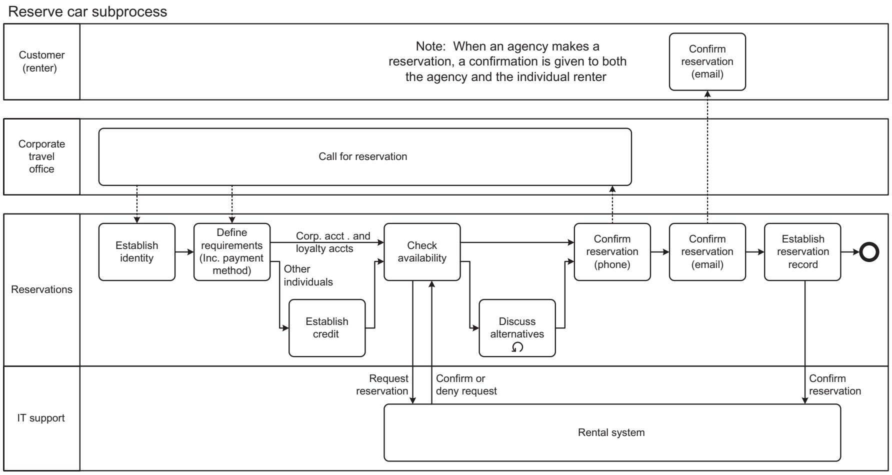

FIGURE 14.17

Level 2 flow diagram of the *reserve car* subprocess.

of rules the team needed to ensure that all the major noun phrases used to describe the rules were used in a consistent manner. Figure 14.18 shows a concept network used to define the rule vocabulary of the Rental Cars-R-Us example.

Here are some examples of business rules for Rental Cars-R-Us that use the vocabulary defined in Figure 14.18 and terms defined in other similar concept diagrams.

- Each **rental** always *has* exactly one **requested car group**.
- The **duration** *of* a **rental** must not *be more than* 90 days.
- A **driver** *of* a **rental** must *be* a **qualified driver**.
- A **rental** must *incur* a **location penalty charge** if the **drop-off location** *of* the **rental** *is* not the **return branch** *of* the **rental**.
- The **rental charge** *of* a **rental** *is* always **calculated in** the **business currency** *of* the **rental**.
- A **rental** may *be open* only if an **estimated rental charge** *is provisionally charged to* the **credit card** of the **renter** *of* the **rental**.

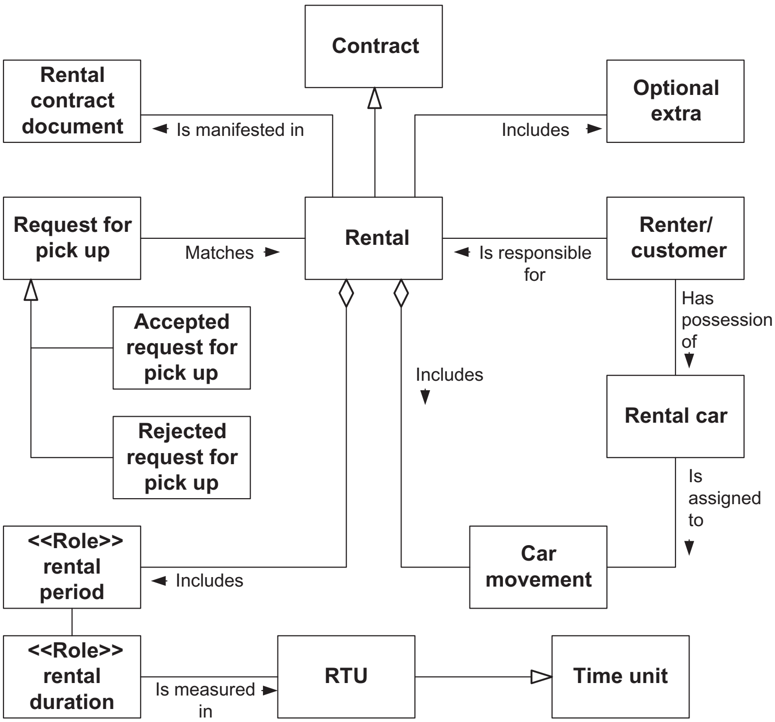

FIGURE 14.18

Concept or data model illustrating some of the terms that one would need to define a consistent set of business rules for the Rental Cars-R-Us organization.

- The **fuel level** *of* the **rented car** *of* a **rental** must *be* ***full*** *at* the **actual start date/time** *of* the **rental**.

As the team analyzed existing policies and rules they began to consider two things. First, some of the rules needed to be made more explicit. Second, the team began to see how the whole process could be automated so that customers could register for a car at a website, avoiding any misunderstandings that might arise if a clerk asked the questions.

Another process the redesign team considered in more detail was the *return car* subprocess. In this case the team simply created an informal expansion of the *return car* subprocess, showing the activities that made up the subprocess (Figure 14.19).

In each case, as we gather data, ask questions, and create more detailed BPMN diagrams, we are focused on what is done and how it is done. Each subprocess can be broken down into a set of activities. We can define output measures for each activity and then gather data to see if the activity works as we expect it to. Is the quality of the output consistent? If we are really concerned we can prepare a scope diagram for a specific activity. Or, we can define the subprocesses of a given activity and then look at how they perform. How long do different tasks take? Could we restructure the work or automate some portion of it to reduce the time it takes? Are there any unnecessary steps that we could eliminate?

As you explore the As-Is process in more detail you will probably want to decompose some of the activities. In effect, you will generate a new diagram for a single Level 2 process, showing its internal Level 3 activities. You will probably not want to do this for all the activities shown on the Level 1 process diagram, but only for those that you know have problems. Moreover, you can do it in one of two ways. You can generate another scope diagram of a Level 2 process, or you can generate a more detailed BPMN process flow diagram, depending largely on whether you think the problem lies inside the Level 2 process or in the way the Level 2 process interfaces with external stakeholders.

As the BPM redesign team explored the *prepare* process and *maintain car* process they began to ask why mistakes were made in car preparation. Figure 14.20 highlights two processes that are essentially manual and are not being done as well as they might.

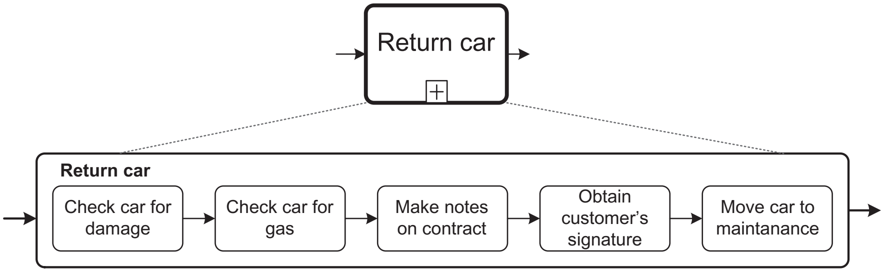

FIGURE 14.19

Subsubprocesses of the *return car* subprocess.

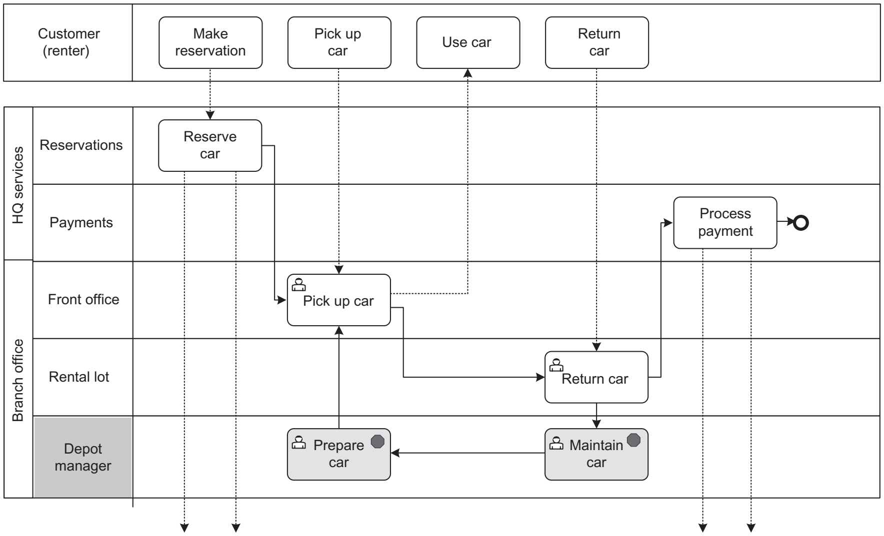

FIGURE 14.20

We have problems with two subprocesses that are largely dependent on one manager and human performance.

In these cases we want to consider the entire human performance environment to decide what intervention might be most effective. Both activities are managed by the same manager, irrespective of whoever is responsible for the specific swimlane.

As you examine any process or its subactivities, if employees are involved you need to ask how the employees are managed. Do they have clear direction and the tools they need? Do they get feedback when they are on or off target? Are there consequences for success or failure? Many employee "problems" are really management problems—and the best way to improve performance is to change the way the manager deals with the employees. It is at this point that a redesign team might consider whether creating a business process management software (BPMS) application to structure and monitor the process at runtime might improve the management of the process.

Does It All Flow Smoothly?

Finally, one looks at the sequence of activities that make up the overall process. Is the sequence logical? Is everything covered? Does the current workflow keep all employees working at about the same pace? Could some tasks be done in parallel to speed up the process? Could exceptions be handled by a separate employee to speed the flow of routine processing?

Phase 3: Redesigning the Rental Process

As with analysis, so with redesign: it can be simple, or vague and complex. In some cases you will identify specific problems and know just how to fix them. Employees do not understand how to do a specific task, and a quick training course will probably solve the problem. A specific activity is being performed that could be eliminated and save time. If the problem is simple, then redesign is usually focused on accomplishing a specific task.

At other times there are many things wrong with a process and it is unclear where you should begin. Usually, the BPM redesign team holds several brainstorming sessions to consider the problems and decide on the nature of the solution they think likely to solve most or all the problems. In the real world resources and time are always limited, and frequently a team will opt for an 80% solution, solving the most pressing problems and leaving less important problems for a later effort.

In this case the BPM redesign team decided to focus on three problems: (1) The problem customers and the organization had getting the reservation agreement right. (2) The problem the organization had getting new cars prepared as requested. (3) The problem that resulted from managers not being on top of what was happening and responding quickly enough. The solution involved a mix of initiatives, including the following:

- Revising the rental agreement to make it easier and less ambiguous.
- Revising the paper application, but at the same time creating a website where customers could make their own reservations. Making the same online reservation system available as an app for smartphones and digital assistants.
- Carefully training all reservations clerks in the new agreement and associated policies.
- Retraining depot personnel in the preparation of cars.
- Developing a preparation quality checklist and requiring managers to check each car before placing it in a stall.
- Developing a BPMS application to provide HQ and franchise managers with more up-to-date information on what is happening at each franchise.

If a major redesign is called for, then the first thing to consider is what the process will look like when it is redesigned. In such a case we usually begin with a To-Be diagram, a suggestion for how the new process will work. Major changes need to be sold—to management, direct (line) managers, and employees, and perhaps to partners, regulators, or customers as well. This takes time, but beginning with a clear diagram of what will change is usually a good place to start.

Figure 14.21 shows how the process redesign team marked subprocesses that were already automated or to be automated in a Could-Be redesign of the *rent car* process that converted the *reserve cars* subprocess into a website where customers could make their own reservations.

Once the BPM team decided that it wanted an automated solution—in this case a website where customers could reserve their own cars and a BPMS app for managers—

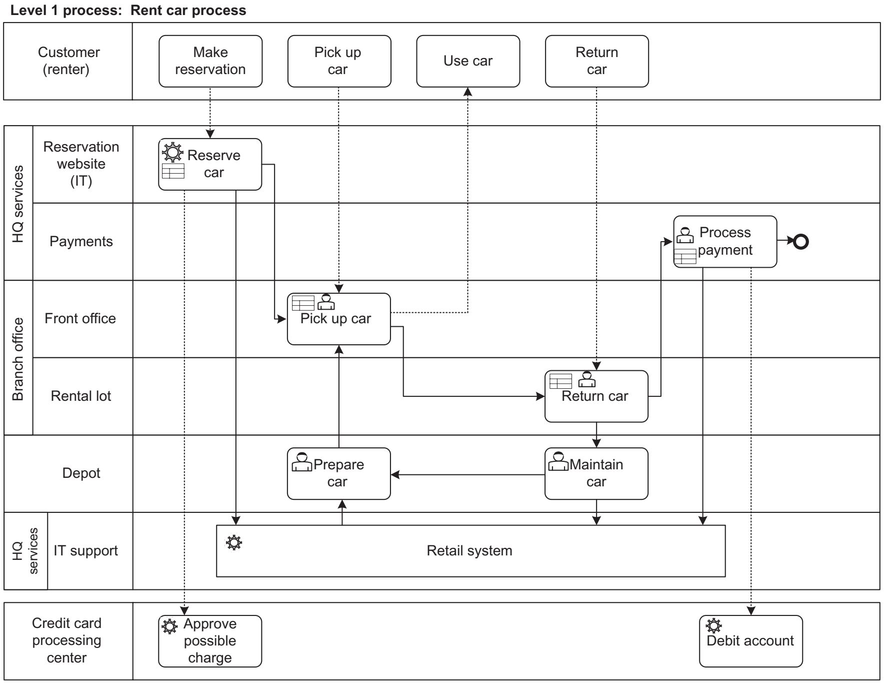

FIGURE 14.21

Basic To-Be process that the business process management team came up with.

the team knew that it would need to develop precise requirement specifications for the website and the BPMN app. Luckily, the BPMN diagrams that they had already prepared would be a good start for both website design and for the development of a BPMS app for managers. Figure 14.22 illustrates one of the diagrams that the team developed to identify a use case that helps define records that were created when a user requested a car.

Here is a high-level description of a use case in which the customer books a car rental:

Customer/Website Will Use Rental System to Define and Book a Rental

- Customer/Website will use Customer/Car Service to define and book a rental.
- When Customer signs onto Website and proceeds to complete a rental car request on the site.
- Steps
  - Establish Nature of Customer
  - Establish Nature of Rental
  - Establish Availability of Preferred Car at Site and at Time/Date
  - Confirm Availability
  - Establish Payment Method

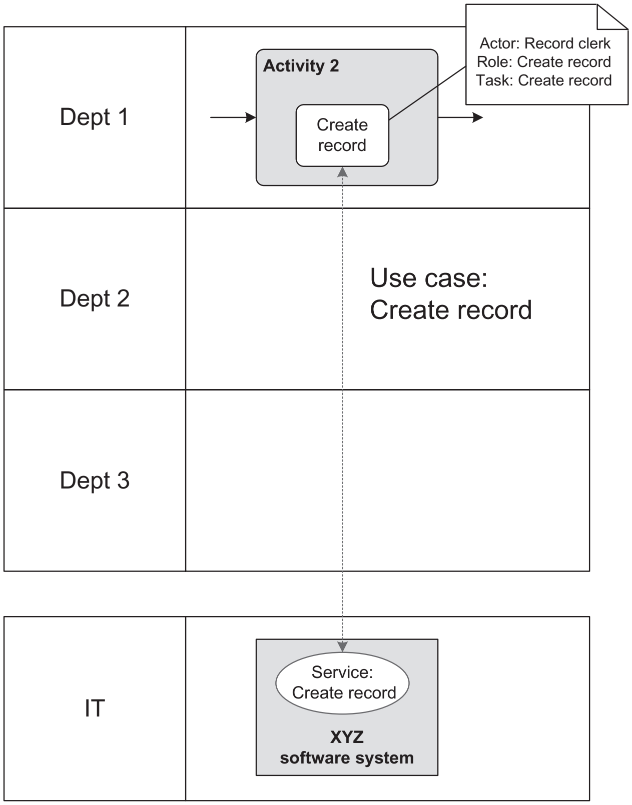

FIGURE 14.22

Create record use case.

- Check Credit
- Confirm Reservation
- Email Reservation to Renter

The BPM team defined what the new To-Be process would look like, sold the concept to management and the people who performed the existing *rent cars* process, and defined the new training and IT resources that they would need to implement the new process. At this point the BPM team project manager began to collaborate with teams from HR and IT as they undertook the actual development of new resources. When called on the team worked with the various groups to define and test the new materials.

Phase 4: Implement the Redesigned Business Process

Implementation involves generating all the resources you require to roll out a new process. If the redesign calls for employee or managerial training someone has to develop or acquire it. If the redesign calls for new employees with different skills, they need to be hired. If the redesign calls for a new software application someone has to acquire or develop it. All these things take time and cost money. Thus it is one thing to do a new design and to get it approved. It is another thing to assemble the resources, and yet another to test and then to actually roll out the new process in the workplace.

In some cases the BPM redesign team undertakes implementation work. More commonly, they delegate it, oversee its completion, and then test that all of the resources work together as required. Thus it is common for the redesign team to let HR develop a new training program or hire new employees, and it is usual for the redesign team to let the IT department acquire or create new software applications. In all cases the BPM redesign team should be heavily involved in defining the requirements and in doing acceptance testing. If they are not, however, they should focus on preparing people in the workplace for the upcoming process changes.

Phase 5: Roll Out the New Rental Process

Rollout refers to all the tasks involved in moving, from having the resources to implement a new process to actually getting that new process up and running. It also includes incidental activities, like a review by the BPM team of its successes and failures, and their recommendations for future BPM teams to improve their work.

Let us assume that the *rent car* process has several changes, including new procedures for booking lease orders, new software for taking orders, new policies for preparing cars, and a BPMS app that helps the local franchise manager monitor the workflow and any problems that occur. This entire package comes with some new employee training and a class for local managers. The corporate organization installs the software and makes versions of it available to the franchises, but it also creates two teams to help local franchises launch the new process. Each team can handle one franchise a week, and so over the course of a year they roll the new process out to all the franchises, according to a schedule developed by the corporate organization. Reviewing report data at the end of the year Steve La Tour is happy with the results and convinced that the franchises are both more efficient and more consistent in the way they handle customers. The data also show that customers are much happier with the company, and La Tour is convinced that the uptick in business is largely the result of improved customer satisfaction and word of mouth about the company's new emphasis on making customers happy.

Manage the New Rental Process

Although not part of the redesign process as such, ongoing execution of the process justifies the redesign effort. The redesign team opted to have the IT group create a BPMS app that would monitor day-to-day franchise performance and highlight problems. That provided local managers with a new tool for monitoring and controlling their work. The BPM rollout included a course for managers that described how to use the BPMS app and included instructions in how to use the information to better motivate employees. Similarly, employee training provided during the rollout encouraged employees to take more responsibility for keeping customers satisfied. One of the new activities, instituted when the new process was rolled out, was a monthly meeting when managers and employees met to deal with problems and brainstorm additional process improvements. Franchise managers reported that this has engendered a new spirit of cooperation that is focused on keeping customers happy.

Notes and References

To reiterate, Rental Cars-R-Us is a hypothetical company, not a specific company. This example is modeled on the logic defined in the Object Management Group's adopted standard "Semantics of Business Vocabulary and Business Rules" (SBVR) (Annex E: EU-Rent Example), which is available at https://www.omg.org/. Interested readers can review the SBVR document for additional information on the logic and business rules that could be developed for this case. (In this example the rules are formatted in RuleSpeak—one of four formats supported by the OMG.)

PART

Implementation-level concerns III

In this third part we consider some of the issues that today's companies face when they seek to implement process changes. Figure P3.1 reproduces the overview of process work that we discussed in the introduction to Part I. In this part we will focus on Level 3 concerns. Once a process redesign team decides to change a process, they typically call on specialists to help them implement the changes they require. In some cases new employees trained in new ways will be required. In other cases new office building in new locations will be required. In still other cases software systems will need to be modified, or entirely new software systems will be required. All these specific changes are made by teams working at Level 3.

There are a number of topics we could address in this part. Because space is limited we are going to focus our discussion of implementation-level concerns on three of the topics that are most important to today's business process managers. We'll begin in Chapter 15 with a look at process modeling software. Any company that is serious about doing enterprise work needs a process modeling tool that can capture information about processes and store it in a repository. By using the same tool and storing information from multiple projects into a single repository a company begins to create an asset that it can enhance as it does more process work. We will also look at business process modeling suites (BPMS), software products that not only let companies capture process diagrams, but go well beyond that and automate the day-to-day execution of those processes. BPMS is an exciting new approach to the management of processes that will revolutionize how we think of processes and IT by the end of this decade.

Chapter 16 will focus on enterprise resource planning (ERP) and related applications and consider how companies can use ERP applications to support process automation efforts. We will then go beyond today's ERP applications and consider how ERP and BPMS are likely to merge in the next decade to provide companies with much more powerful and flexible process management environments.

In Chapter 17 we will consider the likely impact of artificial intelligence on business process design in the next few years. More broadly this chapter will consider the growing role of advanced technologies in transforming business organizations.

Chapter 18 provides a recapitulation of the main points we have made and some final recommendations.

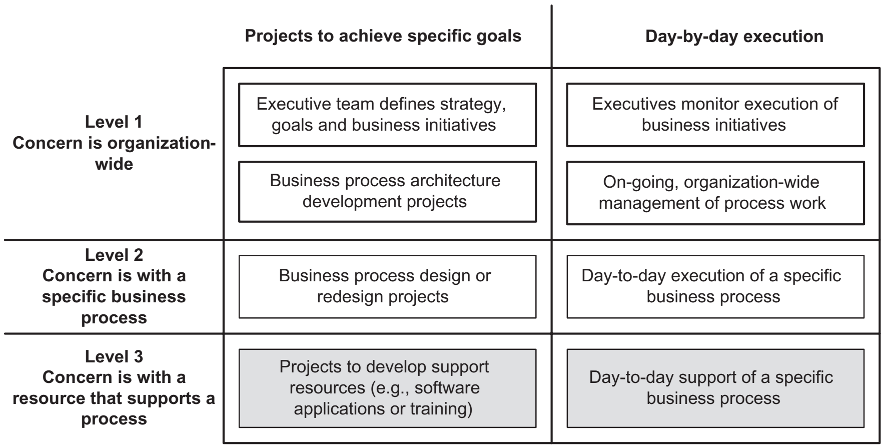

FIGURE P3.1

Types of process activity in organizations.

CHAPTER

Software tools for business process work 15

This chapter briefly describes a range of business process tools. We consider how to select a tool and illustrate how modeling tools can be used by showing how they might be used in the analysis and execution of a business process problem.

Why Use Business Process Software?

We have already suggested that a wide variety of different groups are engaged in different aspects of business process change. Those involved in process automation, for example, already use a variety of software tools to aid them in their work. They use modeling tools to picture processes and document requirements. They use Business Process Model and Notation (BPMN) tools to generate code. Similarly, those involved in workflow automation development use workflow tools to model applications and may then rely on those same tools to implement the results and manage the actual processes during day-to-day execution.

Business analysts and professional business process practitioners usually rely on software tools specially developed to support business process modeling and redesign. We will refer to these tools as *professional business process modeling tools*.

Business managers engaged in business process analysis and redesign, on the other hand, are less likely to use software tools. Surveys suggest that a large number of managers prefer written descriptions. Using this approach a process may be described as a numbered list of activities. Many use simple graphical or illustration tools, such as the introductory version of Microsoft's Visio or PowerPoint, to quickly create flow diagrams. There's nothing wrong with either written descriptions or simple graphics when one is doing informal analysis. When one wants to do something that can be saved, accessed by others, and reused, however, a software tool is needed that can store the models and the associated data in a database. A database specifically designed to store information about business processes is usually termed a *business process repository*. Most professional process modeling tools are designed to work with a process repository.

Many business process teams assign a team member to capture group discussions in a business modeling tool. During analysis and redesign a facilitator usually works with a business process project team to describe the existing or As-Is process and then to create a To-Be diagram. These sessions usually take place on two or three mornings during each week of the project. The facilitator usually stands in front of

Business Process Change. https://doi.org/10.1016/B978-0-12-815847-0.00015-7

the group and makes notes on a whiteboard. Often, teams will use large Post-it notes to quickly create and then change large diagrams on the whiteboard. Thus each day the newly modeled process needs to be documented and changes need to be incorporated in earlier models. A software tool makes it easy to record the results of a morning session, to generate images that can be sent to participants' computers, and to print out neat versions of the process diagrams for the participants. Some facilitators work with an associate who sits at the back of the room and records the session using a business process modeling tool. Others simply use the tool themselves to record the results in the afternoon following the morning session. Since modeling tools can save versions it's easy to record different proposals so the group can document alternative versions of a solution.

Integrating paper documentation that shows processes and subprocesses, goals and measures, and the cost and capacity assumptions made about activities can be quite complex, but a tool makes it easy to keep all the information in a single file, providing a huge increase in the efficiency and productivity of the documentation process.

Some process modeling tools make it possible to simulate processes, so teams can study alternatives or check to see how the process would perform under different flows or constraints. Some managers use tools to track the ongoing results of measurements. In these cases the tool becomes a process management tool.

Finally, if a company is serious about developing a process architecture and expects to keep track of ongoing changes in processes and subprocesses they need a tool to manage and maintain all of their process descriptions. In this case the company should agree on modeling standards so that the outputs of business process redesign teams can be smoothly integrated into the overall model maintained by a process architecture committee.

Variety of Business Process Tools

There are dozens of different software tools available for business process change projects. Figure 15.1 shows how BPTrends defines the business process software market. The overlapping circles suggest that many products combine features from different technologies. In many cases the software vendors began by offering one type of tool—say, a business rule tool—and then as the market evolved repositioned themselves and offered something else—by becoming a business process management suite (BPMS) vendor, for example.

Table 15.1 provides definitions for some of the different types of tools shown in Figure 15.1 and suggests who might benefit most by using them. We have provided generic names, although in fact the various tools go by a wide variety of different names.

Some of the tools described in Table 15.1 are narrowly focused. Others fulfill more than one function. Thus, for example, there are business process modeling tools that are simply designed for one purpose—designing supply chain processes using

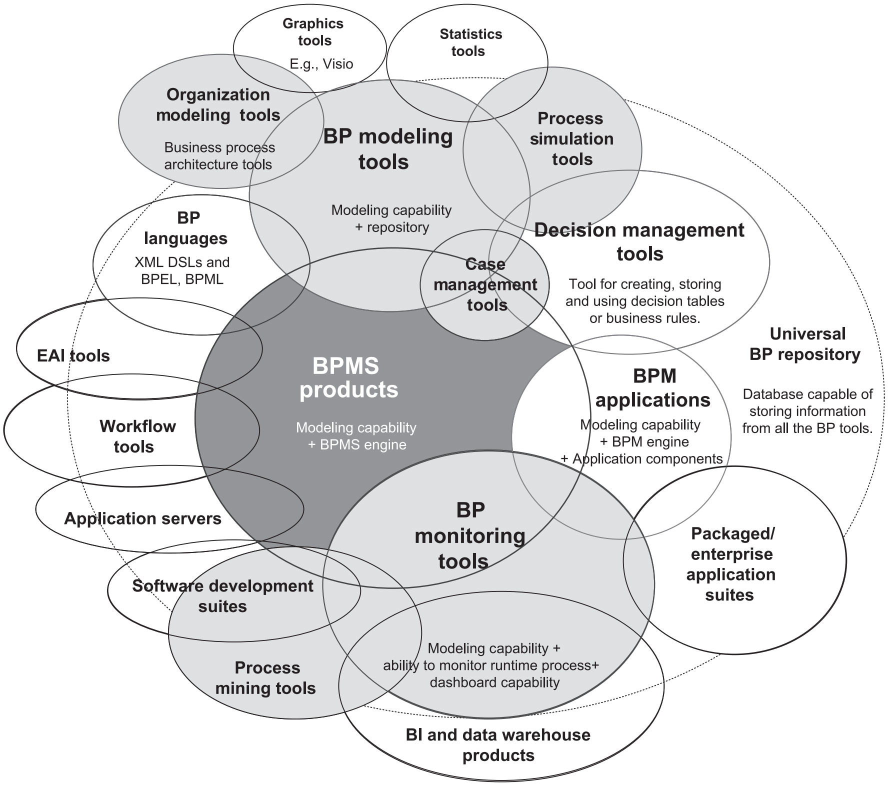

FIGURE 15.1

Business process software market as defined by the BPTrends website.

Supply Chain Operations Reference (SCOR) notation, for example. There are also tools that allow business analysts to develop process diagrams that can later be converted to other notations for software development. There are workflow tools that combine business process modeling and the actual execution of a workflow application.

There are well over 100 business process software tools on the market at the moment. In part, this reflects the variety of ways that companies are approaching business process change. It also reflects the immaturity of the market. In the early years of the millennium we predicted that the business process management (BPM) tool market would mature and consolidate, leaving only a few, powerful BPMS tools. In fact, although there has been considerable consolidation, new vendors keep entering the market. This reflects a dual need for powerful, complex BPMS tools and at the same time a need for simple tools for less sophisticated process analysts and managers.

In the remainder of this chapter we'll focus on only two types of process modeling tools, professional process modeling tools, and BPMS tools that can both model and then execute processes.

Table 15.1 Overview of Some of the Software Products That Can Aid in Business Process Change

	Users		
Software Products	**Executives, Line Managers, and Business Managers Engaged in Informal Business Process Improvement Efforts**	**Executives, Line Managers, Business Managers, Business Process Team Leaders, Business Analysts, and Employees Engaged in Business Process Redesign or Improvement Projects**	**Software Analysts and Developers Engaged in Developing Applications to Improve a Business Process**
Organization modeling tools. Software tools that aid in the analysis of corporate strategy, competitors, customer needs, and threats and opportunities for process improvement. Tools that maintain enterprise process architectures		Professional business process modeling tools	
BP modeling tools. Software tools that aid business teams in the analysis, modeling, and redesign of business processes. Includes methodologies, modeling tools, activity documentation, and simulation and costing tools	Graphic and illustration tools	Professional business process modeling tools	Professional business process modeling tools
Decision management tools. Software tools that help business teams define decisions and capture information about the decisions as decision tables or rules. Some tools analyze rules at runtime and generate a decision		Decision management (business rule) tools	Decision management (business rule) tools
Process-mining tools. Software tools that help business or software analysts examine the pattern of historical process events to determine flow through an existing process		Process-mining tool	Process-mining tool

BP monitoring tools. Software tools that aid in creating measurement systems for business managers responsible for managing or implementing new business processes. Includes tools that monitor ongoing business processes		Process monitoring and measurement tools	
Statistics and BP monitoring tools. Software tools that analyze data to aid in process improvement		TQM tools, Six Sigma tools, business process management tools with statistical utilities	
Packaged ERP applications. Software applications that actually automate a business process, including enterprise resource planning, customer relationship management, and other packaged applications. Tools that are tailored to help tailor enterprise resource planning			Packaged enterprise resource planning applications
Software modeling tools. Software tools that allow software developers to model processes and then create software applications to support the modeled process			Software modeling tools
BP modeling tools that support frameworks. Software tools that support the development of specific types of applications (e.g., tools that support the Supply Chain Council's Supply Chain Operations Reference framework)		Professional business process tools that support the Supply Chain Operations Reference framework or other frameworks	
BPMS products. Software tools that allow analysts to model a process and then automate execution of the process at runtime. Business process management software products often include decision management support and monitoring and support of frameworks	Business process management software products support managing processes	Business process management software products support analysis and modification of processes	Business process management software products support software development or modification
Process-mining tools. Software tools that allow analysts to use event data from previous process executions to determine the exact flow of historical processes		Products that support the analysis of historical process flow	Products that support the analysis of historical process flow

Professional BP Modeling Tools

Figure 15.2 provides an overview of the key features we expect from a professional business process modeling tool. It provides interfaces in which users can create organization and process diagrams. Unlike the simpler tools that only create diagrams professional tools store the model elements in a database, usually called a *repository*, so that any information gained can be reused. Similarly, whenever a user creates a modeling element on a diagram the user can click on the modeling element and enter information about the element. Thus if we create an organization diagram and name six departments we can later create a process diagram and have those six department names automatically inserted as the names of the swimlanes. Similarly, if we create a process called *sell widgets* and then define a number of activities that occur within the *sell widgets* process we can click on the *sell widgets* process in any diagram it occurs in and get to the diagram that shows the activities within *sell widgets*.

The heart of every professional business process modeling tool is a database, or the business process repository, in which all elements of a business process and all the relationships between those elements are maintained. Graphic tools—like Microsoft's Visio, which is very popular among business modelers—only support diagrams that are equivalent to pages of paper that have a process diagram on them. Each page or diagram is a thing in itself. Creating one diagram doesn't help you create the next. A professional business process modeling tool, on the other hand, stores each element in its database (or repository). Thus, as you create one diagram, you are storing information about processes and relationships that you can use on subsequent diagrams.

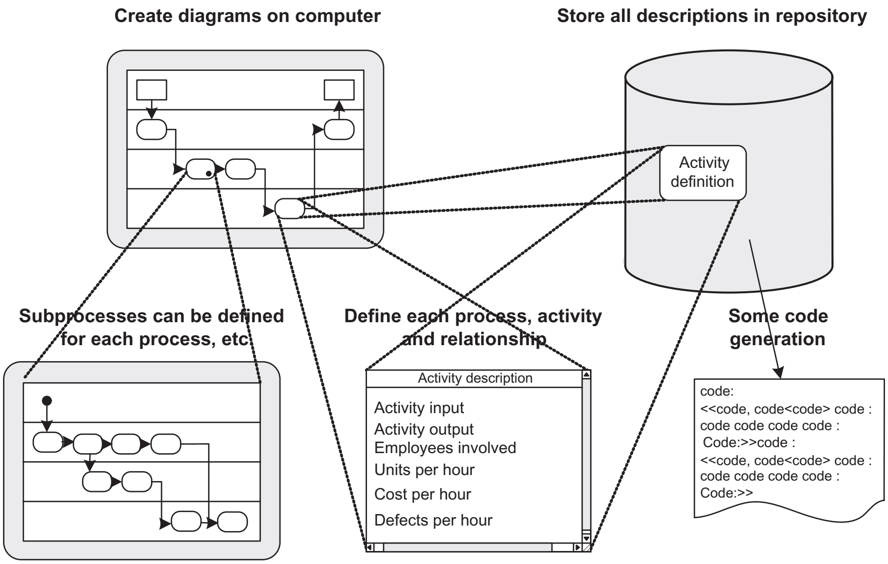

FIGURE 15.2

Key features of a professional business process modeling tool.

As you proceed you rely less and less on drawing new elements and more and more on telling the database what previously entered elements you want to place on your diagram.

Most business process tools support some kind of code generation, if for no other reason than to allow users to pass information about a process to other process tools. Increasingly, business process tools will support an XML business process language. Most also support BPMN or some software language so that software developers can begin where business managers leave off. Code generation isn't a feature that business process redesign teams need, but it can certainly make it easier when a business process team wants to submit a redesigned process to a software development team.

There are a number of other features that we don't show in Figure 15.2. For example, if the tool is going to be used for Six Sigma projects it's nice to have statistical utilities or a clean interface to a popular statistical package. If the tool is going to be used with a methodology like the Supply Chain Council's SCOR methodology the tool should probably offer templates for SCOR models.

The key thing about using a professional modeling tool isn't that it helps you do the initial process analysis, but that it serves as a database to store all the information you gather about the process as the analysis effort proceeds. Then, as the team goes from one process to another or drills down into a single process, the tool keeps track of each activity name. If you reuse a name the tool challenges you to ensure that this latest activity is the same as the earlier activity of the same name. If it is you automatically inherit all the information you have already defined for that activity. If it's new the tool requires you give it a unique name, and so forth.

In a similar way, the tool is prepared to generate matrices as you accumulate information. Thus you may later want to know all the processes that a given department or manager is responsible for managing. A good process modeling tool can quickly generate such a list from its repository.

If you were working by hand you would have to create one diagram to describe the existing process and others to model each of the possible To-Be solutions your team might suggest. Using a tool one creates the As-Is diagram and then generates To-Be diagrams by saving a copy of the As-Is diagram and then modifying it. One can easily end up with a whole collection of Could-Be diagrams before one selects the final To-Be solution.

Similarly, once you have an As-Is diagram, you can choose specific activities to define in more detail, in effect creating new diagrams that describe the inner workings of activities on the original As-Is diagram. You can also enter information into tables associated with any given activity. Thus the team can list the job roles associated with each activity, list the time it normally takes to complete each activity, and list the costs of resources used in each activity. It can also list or point to business rules or decision tables associated with each activity. All this information becomes part of the database and is associated with the process whenever you do any subsequent process work.

Some professional modeling tools support simulation. Once you have provided information about how each activity works you can develop a set of cases (instances of the process with associated data) and run the cases to see how long a given set of cases would take. One often finds new problems during a simulation that would have been hard to anticipate when simply looking at a diagram. For example, it may be that you only have two employees assigned to a given activity, but that the activity takes quite a long time. The result, when large numbers of instances are being executed simultaneously, is that there is a bottleneck and that the process slows down because the two employees cannot keep up with the demand. Running simulations can quickly identify problems of this nature.

A modeling tool also makes it easy to keep track of when a process accesses a database. This isn't something that a business process team worries too much about when initially redesigning a process, but it can be very important later, especially if the process model initially developed by the process team is later passed to a software development team.

Modeling and Management Screens

Whether you use a professional process modeling tool or a business process management suite you will use a combination of graphics and tables to record information about the business processes you want to analyze and then redesign. Both types of tools require that you learn how to use them. They are more complex than simple modeling tools because they require that you create a repository to keep track of all the processes, activities, flows and roles that are involved in each process. The reward is that the tools will provide considerable assistance as you move on to more complex modeling.

The screen images that follow suggest some of the types of interfaces you will need to learn to deal with. We have chosen Qualisoft's Qualiware tool because we have worked with the vendor and because the tool supports all the diagrams we use in this text. Most BPMS tools support BPMN, but only a few support the type of stakeholder and scope diagrams we use throughout this book. If the tool is going to be used with a methodology, like the methodology described in this book, then it is good if the tool supports all the diagrams the methodology uses. Our methodology, for example, relies heavily on scope diagrams. We've pictured a scope diagram in Qualiware in Figure 15.3. Then, in Figure 15.4 we picture a BPMN diagram. Finally, in Figure 15.5 we show how one might obtain information via a matrix.

Business Process Management Suites

A business process management suite (BPMS) refers to software products that evolved in the past decade. In essence, BPMS products combine features previously found in (1) workflow and document management tools, (2) enterprise application integration (EAI) tools, (3) professional business process modeling tools and (4) new technologies derived from the Internet. Think of a BPMS product as a professional modeling tool with a lot of additional capabilities.

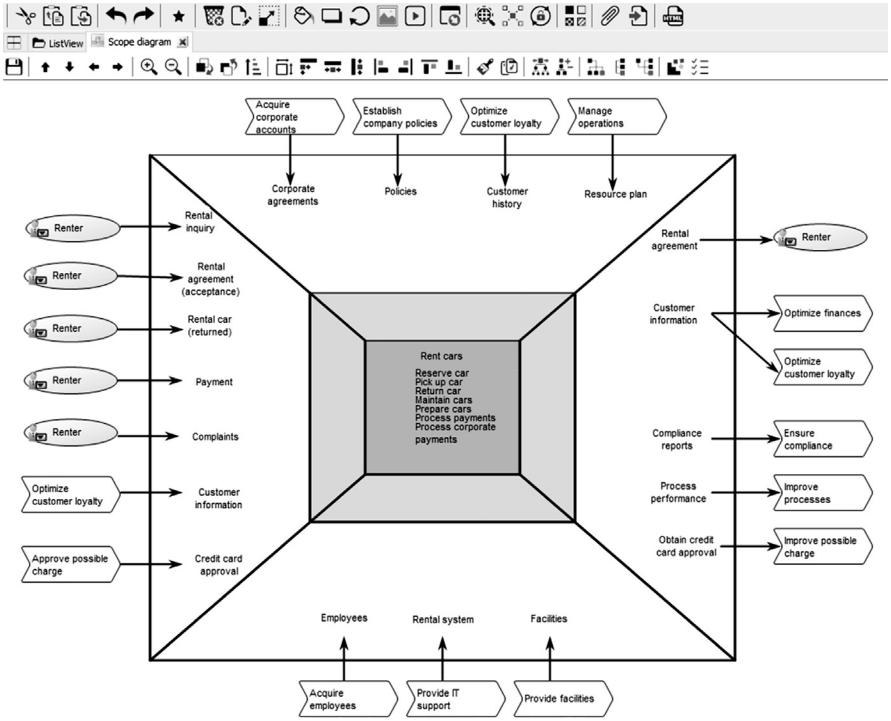

FIGURE 15.3

Qualiware screen showing a scope diagram.

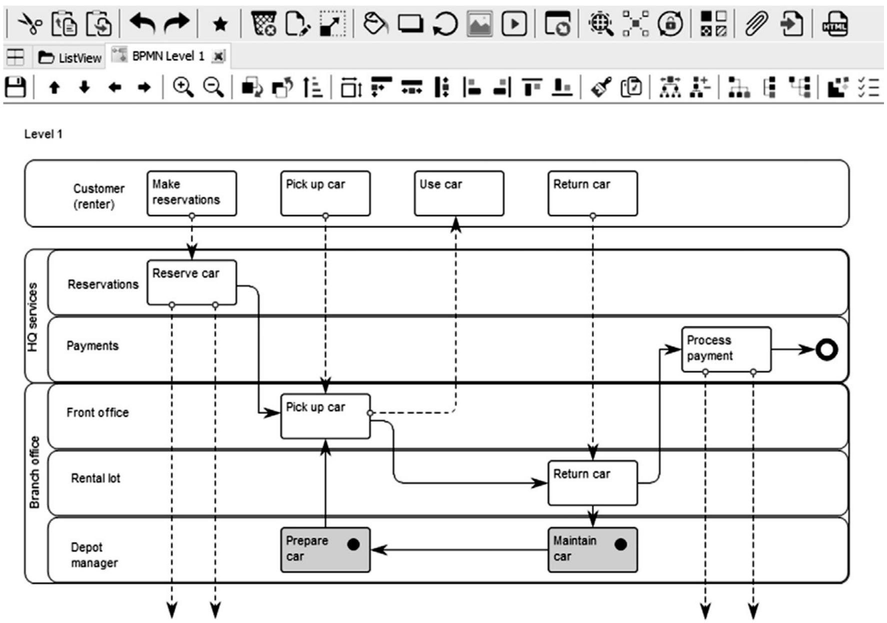

FIGURE 15.4

Qualiware screen showing a Business Process Model and Notation diagram.

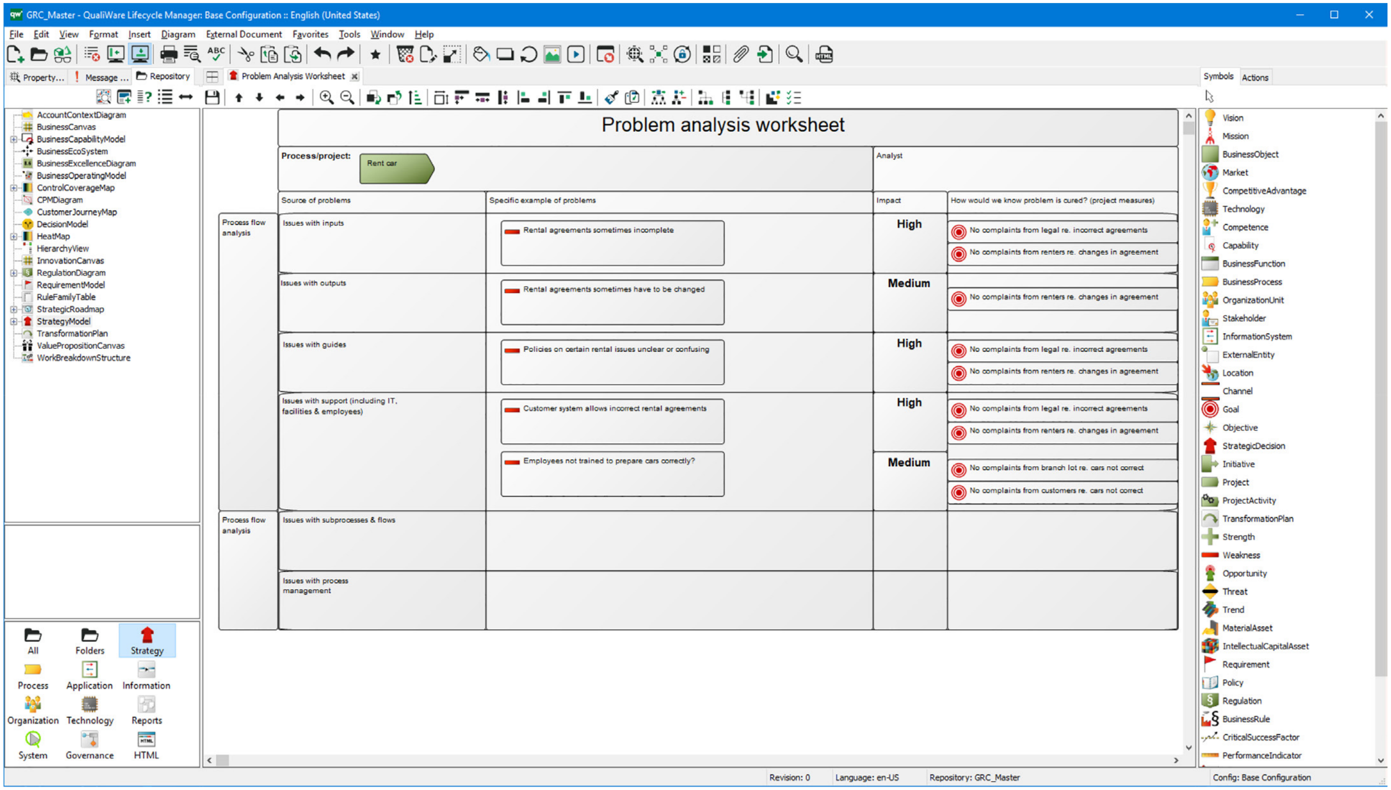

FIGURE 15.5

Qualiware screen showing use of a worksheet.

In the 1970s and 1980s IT groups created software applications at the request of departmental or functional units. Thus the accounting department has accounting applications and an accounting database. Similarly, manufacturing and sales each had their own applications, each with its own database. In the 1990s, in conjunction with the emphasis on business process reengineering, companies began to struggle to integrate departmental activities into processes that crossed departmental boundaries. This immediately put pressure on IT to find ways to make it easy for departmental applications and databases to work together and exchange information. The three different types of software tools mentioned above evolved to help facilitate this change.

Workflow tools were created to make it easy to manage processes in which employees processed documents. In essence, an incoming document was scanned and placed in a database. Then a digital copy of the document was sent to an employee's computer when the employee needed to interact with the document. At a minimum, workflow systems speeded processing by eliminating the time otherwise required to physically move documents from one employee's workstation to the next. Instead, as soon as one employee finished working on a document and selected SEND the database system would place a copy of the edited document in the queue of the computer terminal of the next employee who needed to work on the document.

At the same time, other software developers focused on building software systems that would manage a diverse set of software application. Rather than try to redesign an application originally designed to work only for one department to work with other applications a whole set of applications were interfaced with a single EAI tool that would move information from one departmental application to another as needed. EAI tools made it possible to operate a number of applications as if they were integrated.

Stepping back from the specific EAI tools we can see that IT tried to solve the problem created by diverse software applications by creating a new application that managed other applications. Similarly, workflow systems sought to integrate employee efforts by providing each employee with a computer and then using a workflow application to manage the movement of work from one computer to another.

The limit on both early workflow and EAI solutions was the lack of a common infrastructure. It was expensive to "wire" diverse things together using the infrastructure technologies available in the early 1990s. All that began to change in the late 1990s when companies discovered the Internet. The Internet was created by the government and used a set of common, open standards. Equally importantly, the Internet was designed to operate over ordinary telephone lines. As the Internet evolved rapidly in the late 1990s a number of technical standards like SOAP and XML were created that made it even easier to interface older software systems and applications with the Internet. That process continues today and most companies have now moved to a service-oriented architecture (SOA) or to Cloud computing, approaches that rely on the latest open Internet standards that make it even easier to integrate applications.

In 2002 a number of different authors and vendors began creating a new type of software that would combine features of the Internet, workflow software, EAI, and process modeling to create a product capable of managing the execution of business processes. In essence, the workflow elements would manage human activities within the process and the EAI elements would manage software applications and databases used during the execution of the process. Everything would be integrated via the Internet and the open protocols created for the Internet. This vision has been variously termed BPM or BPMS. We discourage the use of BPM and opt for BPMS, since BPM is already widely used to describe all kinds of business process work, including much that won't be incorporated in new software applications.

A BPMS product is a software tool that one can use to develop one or more BPMS applications. A BPMS application is an application that is managed and executed by a BPMS tool. Thus a BPMS application describes a business process and incorporates a BPMS engine that will execute the business process in real time. Imagine a BPMS application designed to manage insurance claims processing. The claims processing process is described by means of a process diagram and can be examined by either the business managers or the IT developers. When an actual claim arrives the application manages the processing of the claim. In fact, the BPMS application is a template of the process, just like any workflow diagram. When the application is asked to manage a specific instance it creates a copy of the template and then maintains the data related to the specific claim in a file in a database. Unlike the template, which shows decision points and multiple branches, a real instance reflects specific decisions and only follows a single path.

If the interfaces are good and the business managers can read a basic process flow diagram the business manager is in a unique position to make or request changes in the business process. The key here is that the actual software applications and databases and the data being processed by employees are all maintained independently of the BPMS application. By simply changing the diagram or the business rules in the BPMS application the business manager can immediately change the way the application functions. In the best case the business manager can make specific changes. In any case the business manager can communicate with IT by describing a process change without being concerned about the underlying implementation details. A BPMS application ensures that business managers and IT developers will communicate by talking about specific processes.

BPMS represents an evolutionary development that has its roots in business process modeling, CASE (computer-assisted software engineering), workflow, rule-based systems, EAI, and packaged applications. Today, vendors who would formerly have positioned their products in one of these categories have repositioned their products and now refer to them as BPMS products.

Gartner estimated the revenue from BPMS sales would reach between \$520 million and \$543 million in 2003 and estimated that the BPMS market would generate more than \$1 billion by 2009. In 2015 Gartner estimated that the BPMS market had reached \$2.7 billion. Keep in mind that most of these sales would have been recorded as workflow or EAI sales a few years earlier.

Process Diagrams and BPMS Engines

In essence, a BPMS product is a software package that allows a business manager or business analyst to describe a process and later to modify the process as needed. From a software architectural perspective one could describe BPMS as a new layer of software that sits above other software applications and uses business process specifications to determine when to make use of those other software applications.

The BPMS product includes a process-diagramming interface for the business analyst to use to define the process to be managed and a BPMS engine that generates instances of applications when they are needed and terminates them when they are completed. There's quite a bit more to it, but let's start with a simple overview. In Figure 15.6 we picture the two core BPMS elements. One is a graphical modeling environment that allows the developer to create a description of the business process. (In the case of Figure 15.6 the process consists of five activities, labeled A through E.) The other main element is a BPMS engine that follows the script implicit in the process description and manages the creation of instances as specific cases are processed. In effect, a business analyst describes what is to be done, and the engine then "reads" the description whenever the process is executed, invoking each implementation component in order.

Notice that the BPMS system in Figure 15.6 is managing both employees and software applications. In other words, BPMS can combine the ability to manage human tasks (usually called workflow) and software systems (usually called EAI). Obviously, the BPMS system interacts with employees by means of a computer interface, sending requests for information or decisions to employee terminals, waiting for a response, and using the responses to continue executing the process.

Let's be sure we understand the primary value proposition of those who advocate the use of BPMS systems. BPMS systems should make it possible for managers or business analysts to change how processes work without having to ask IT to

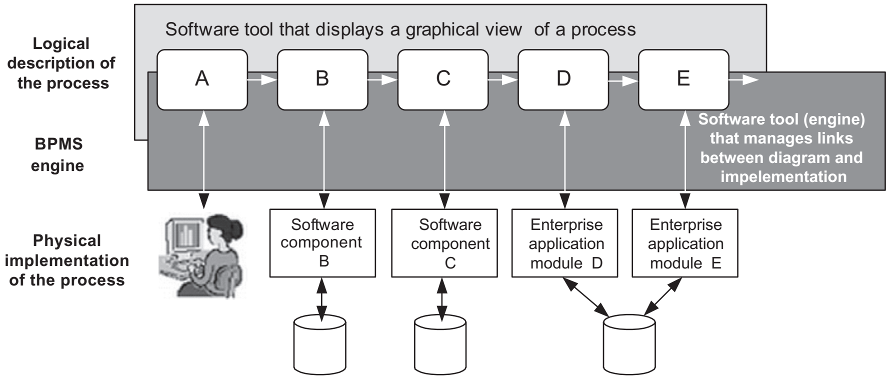

FIGURE 15.6

The two core elements of a business process management software product.

reprogram. Some claim any business manager would be able to do this, but that's unlikely, except in the case where the business manager feels really comfortable with software systems and process diagrams. (Recall that most business managers today do *not* define processes with diagrams. Instead they use text outlines.)

Figure 15.7 suggests how a business analyst might have used the process design tool in a BPMS package to change a process diagram and thereby automatically change the way the process is executed at runtime. We assume that the same underlying implementation components are still in place and that they function as they did in Figure 15.6. Now, however, the order in which they are invoked has changed. Whenever the process is executed the BPMS engine will read the new diagram and execute the steps in the new order. Moreover, the changes have been accomplished without the intervention of IT developers.

We have pictured the changes in the flow of the process as a change in the arrangement of the activities in the diagram. Some tools allow the user to literally change the way the arrows connect to boxes to effect this redesign. Other tools rely on business rules that state how decisions are made and what activities follow certain decisions. In those cases the manager or business analyst can achieve the changes by simply editing business rule statements. In this case the BPMS engine is executing business rules rather than simply following a workflow description.

The ability of a BPMS product to reestablish links to underlying software components without the intervention of an IT programmer requires a rather flexible BPMS engine. We will discuss the implications of this flexibility a bit later. Meantime, we want to underline what the BPMS package did *not* do. The BPMS product, as we have defined it, did not create any new components. It simply allowed the business

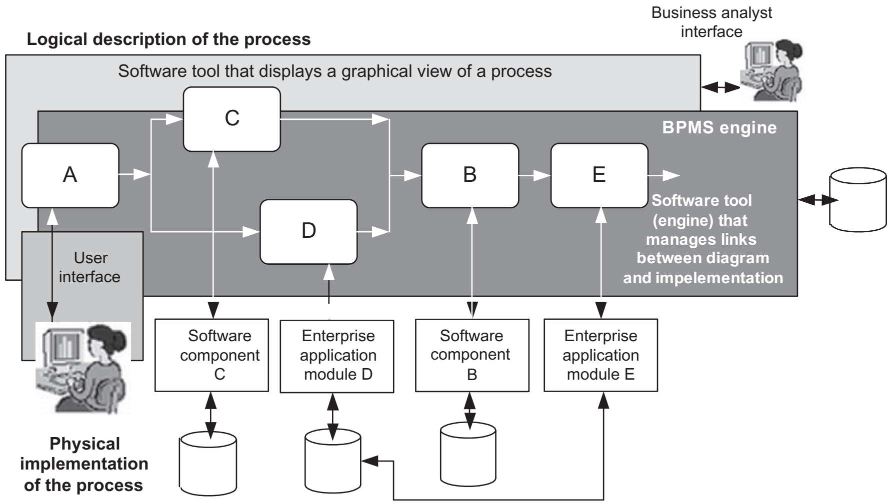

FIGURE 15.7

Business process management software product used to reorganize how the process is implemented.

analyst to rearrange the order in which existing components were used. Some BPMS advocates have suggested that BPMS products will "automatically" generate the code needed to provide new implementation functionality. We don't believe that will be a key part of most BPMS products. On the other hand, some products will allow developers to create code in the tool, and thus to capture business rules that will structure or supplement the functionality of existing software applications.

Before that, however, let's consider the elements required by a comprehensive BPMS, which so far we have not yet discussed.

What Features Might a BPM Suite Include?

Figure 15.8 provides an overview of one possible architecture for a BPMS product. The BPMS product here would be a rather comprehensive tool or suite.

To simplify our discussion we have divided the BPMS package into four layers. The bottom layer is labeled Middleware/Application Server. Any BPMS product needs to be able to manage accessing and being accessed by other software applications. A few BPMS products handle these functions, but most rely on existing middleware and application server products to provide this support. The most popular platforms are IBM's Java server, WebSphere, Microsoft's Windows, .NET, and BizTalk's server. The leading packaged application vendors offer their own servers to facilitate access to their enterprise resource planning (ERP) and customer

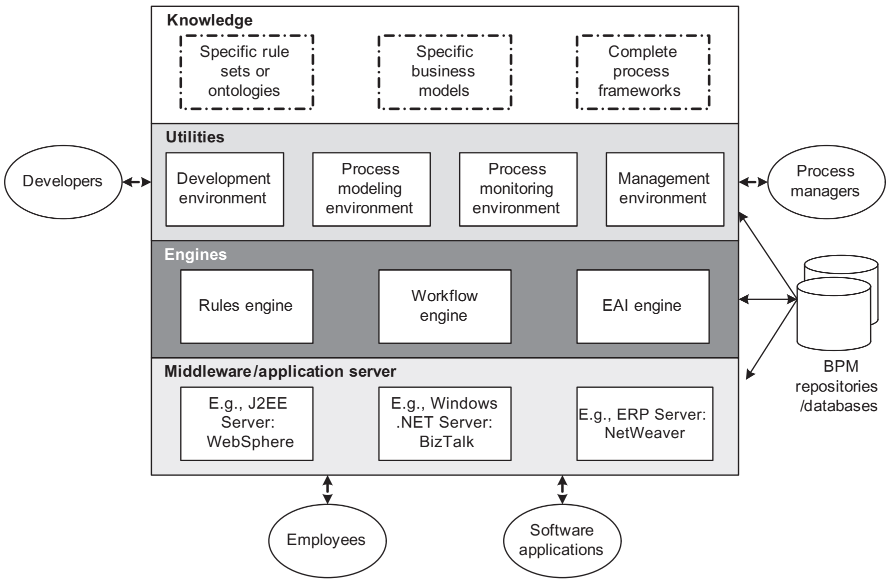

FIGURE 15.8

Architectural overview of business process management software.

relationship management (CRM) applications. Thus, SAP offers NetWeaver, which enables and manages access to many of the SAP modules companies use.

The heart of a BPMS product consists of the engine that manages the runtime execution of business process instances. Most BPMS products offer two or three engines. One engine manages the execution of workflow aspects of a process. At a minimum the engine locates the appropriate employee's terminal and routes information to and from the employee. Most workflow engines do a lot more. Many, for example, will generate "task lists" for the employee, defining exactly what the employee is expected to do. Others will monitor groups of employees and determine which employee is available or has the skills required for a specific type of task.

A second BPMS engine (the EAI engine) usually manages the calling and coordination of software applications required for the execution of a process. These engines turn other software applications on and off, move data to and from databases, and manage all the associated activities.

A third engine is typically used to manage the maintenance and execution of business rules. When a decision point is reached the rule engine will determine which business rules apply and then examine them to determine the appropriate decision.

Most BPMS products have a history in workflow, document management, business rules management, or EAI. Typically, the vendor has a strong engine to execute the kinds of activities they have historically specialized in, and is working to extend or acquire other engines. Thus, today, if you want to manage processes that are primarily people based you will want to talk with a BPMS vendor with historical strength in workflow. On the other hand, if you want to develop an application that will be primarily software based you will probably fare better if you work with a vendor with a strong EAI background. As the market evolves and mergers continue to occur BPMS products are gradually acquiring strong engines for all different types of applications. Equally importantly, they are gradually rewriting their software so that it is well integrated and so that users can deal with simple interfaces that allow them access to all the different engines and capabilities of the BPMS product.

The third layer includes utilities that are required for the development of a BPMS application. The business analyst needs a development interface that he or she can use to describe the process to be managed. The business manager needs an interface that will make it easy to modify the application as the process changes. Both need a modeling environment that provides a graphic overview of the process that will be executed when the application is used. Similarly, both need an environment that will make it possible to capture data as the process is being executed so that the business manager can determine how the process is performing. In addition, many tools provide a spreadsheet-like interface, so that everyone can see and edit the business rules that are used in the process. In the worst case the BPMS product has been assembled from many different, earlier products and there are a variety of incompatible interfaces that the manager and developer must master. In the best case the vendor has created common interfaces that let the analyst or manager move easily and smoothly between the various elements that must be coordinated, managed, or changed.

Most early BPMS tools limited themselves to the three layers we have just described. Currently, a number of BPMS tools also include knowledge elements that make it easier to create specific types of business process applications. Let's say you want to create a BPMS application to manage the day-to-day execution of a bank process. In that case a BPMS tool that came with sets of business rules typically used for major bank processes, or with workflow diagrams that describe typical bank processes, would save you time as you sought to create your bank application. Similarly, a BPMS package that provided the Supply Chain Council's SCOR framework of process and performance measures would make it a lot easier to quickly create a supply chain management system. Predictably, as BPMS products become more mature, some BPMS vendors will specialize in specific industries and include sophisticated packages of knowledge elements with their products.

Most BPMS products being sold today provide a limited type of monitoring. They record events as they occur, summarize that information, and provide data on a manager's interface. This kind of monitoring is appropriate for supervisors who have immediate responsibility for the specific process. Let's assume we were using a BPMS application to manage a call center, assigning incoming calls to operators according to their availability. In this case the BPMS system would let the supervisor know how many calls each of the various employees handled in a given time period.

More sophisticated monitoring requires quite a bit more technology. To create an executive dashboard that would provide useful information to a VP responsible for a large business process, for example, we would need to combine data from specific processes with information from many other sources. We might also want sales data, data about recent customer surveys, or data from suppliers. All these data would need to be accumulated in one place—in a data warehouse, for example—and then they would need to be analyzed and filtered so that only summary data were provided to the senior manager. The analysis and filtering operations usually rely on data-mining systems and on *business intelligence* (BI) techniques. Only a few BPMS products provide the additional technologies to support data warehouse, BI, and executive dashboards (Figure 15.9).

BPMS, SOA, and the Cloud

A BPMS product could use any of a variety of different infrastructure techniques to link to software applications. Historically, each of the EAI tools created their own engines to manage access and linkages. In the last two decades, however, the rapid rise of open Internet standards has focused most developers on a new approach that is usually termed service-oriented architecture (SOA).

SOA depends on the Internet and a collection of Internet protocols, including XML, SOAP, UDDI, and WSDL. It depends on organizing software applications as software components that can be called via the Web. A manager considering how his or her company can outsource business processes while still maintaining control over

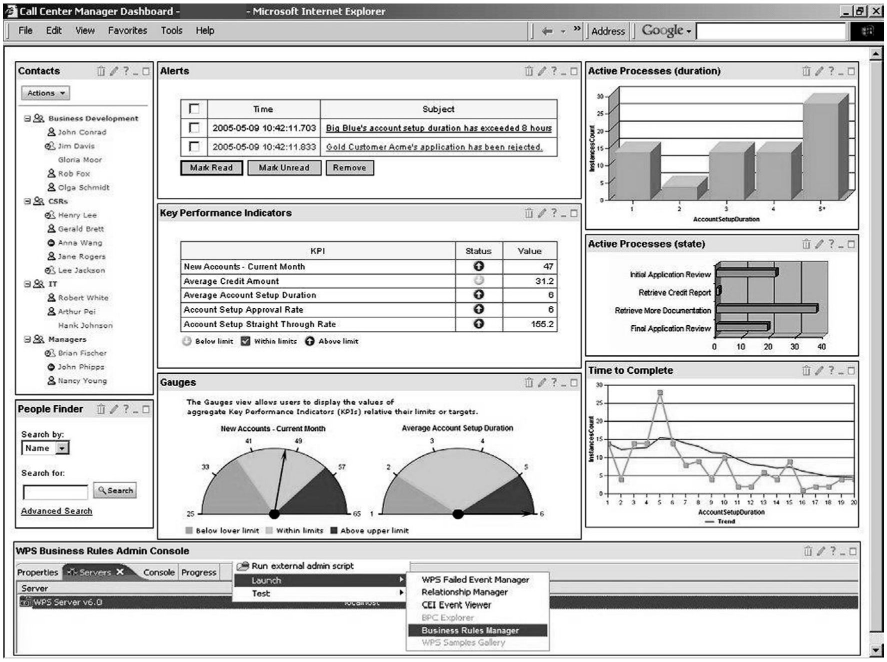

FIGURE 15.9

Senior management dashboard developed in an IBM WebSphere business process management product.

the outsourced processes doesn't need to know any of the details. He or she simply needs to know that SOA is a cost-effective way to organize and integrate distributed software assets.

BPMS does not require SOA, but SOA certainly requires BPMS. Services don't make any sense without the context that business processes provide. Conversely, the runtime automation of a business process assumes an underlying layer of services, middleware, and, ultimately, software components, and SOA currently provides the most cost-effective way to organize that infrastructure. Even human-focused BPMS systems designed to automate the work of teams of employees still assume the existence of the middleware and software needed to send information to employees' desktop PCs and to store the results in appropriate databases.

In the last few years BPMS vendors have begun to focus more attention on the Cloud than SOA. The Cloud is a term that describes computing architectures in which all or most of an application and all the data for the application is stored on a database that is accessed via the Web. Thus, if one wants to use IBM's BlueWorks one does not need to load the software on one's mainframe or laptop. Instead, one downloads the program from an IBM server (the Cloud) whenever one wants to use it. If one creates an application via BlueWorks the application code and any data created when the application is executed are stored on the IBM server. This saves the analyst, developer, or user from needing to have the software on a computer—and also means that the application can be run on a small machine, such as an iPad or perhaps even a smartphone. It also guarantees that the software program the user accesses is always up to date. Access, of course, depends on the speed of one's Internet connection, but that problem is rapidly being resolved, especially in large organizational environments.

The hope is that, eventually, businesspeople will be able to focus on the business process layer and make changes there, using BPMS tools that will available anywhere, and will more or less automatically rearrange activities on underlying layers. The reality today, however, is that most companies are working to create systems that integrate all these layers and that both BPMS developers and SOA developers need to worry about all aspects of the architecture. Thus most BPMS efforts involve teams of business and IT people working together.

Choosing a BPMS Product

Figure 15.8 provides one way to think of the different capabilities of a BPMS product. In this case we picture a "radar diagram" that we have used to evaluate BPMS products. We begin by creating one branch for each feature set that is important to us. Along each branch we indicate the criteria we use to determine if the product lacks the feature, has some of the desired capability, or implements the feature in the best possible way. We make notes about the uses a particular company wants to make of the BPMS product to help users think about what's most important to that particular company. Then we map each product we are considering onto the radar diagram. Using dotted and dashed lines, as well as shading, it is easy to map and compare several applications.

The shaded area in Figure 15.8 suggests what some particular company decided it absolutely needed in any BPMS product it considered. The two lines show how two specific BPMS products were evaluated. In this case neither provided the minimal functionality that the company felt it required. We provided this example not to provide a definitive way of evaluating BPMS products, but to suggest how to approach the problem, and to underline the fact that the acquisition of a real product will involve a series of compromises.

Some Leading BPMS Vendors

Without trying to be comprehensive here's a list of the BPMS vendors that we keep running into at shows, where we have either discussed their products directly with them or have talked to companies that have used those products to develop a BPMS application.

The three vendors that seem to have the largest presence in today's market are IBM, Pegasystems, and Software AG. The other vendors on this short list are major players with a slightly smaller presence:

- *Appian* (Version 6). Appian is one of the smaller players in the BPMS space and has a reputation for being relatively easy to use.
- *HandySoft* (BizFlow). Another small vendor that has been around since the beginning and has a good reputation.
- *IBM* (Business Process Manager Version 7 and WebSphere Operational Decision Management Version 7). IBM is the largest player in the BPMS market and has acquired a wide variety of tools. After a period of consolidation IBM is now offering a relatively integrated and consistent BPMS package.
- *OpenText* (a variety of products). OpenText has also acquired a variety of tools, but has a way to go to integrate them.
- *Oracle* (Business Process Management Suite). Like IBM, Oracle has acquired a variety of earlier vendors, but has a way to go to integrate everything. Oracle's overall commitment to the BPMS market seems to wax and wane.
- *Pegasystems* (PegaRULES Process Commander Version 6). Pega started life as a rule-based expert systems vendor and morphed into one of the strongest BPMS players. Those who like a rule-based approach to software development tend to like this tool.
- *Software AG* (webMethods BPMS Version 8). Software AG came to BPMS late with its acquisition of webMethods, but followed that with its acquisition of IDS Scheer's ARIS, thus catapulting itself into a leading position in the process software market.
- *Tibco Software* (a variety of tools). Another major vendor that has acquired a variety of tools and has yet to integrate them as well as it might.

Beyond this short list of vendors we could easily add another 20 names of vendors who are active in the BPMS space. Some are focused, like the vendors above, on selling to IT groups, but others are focused on vertical markets or on selling to business groups who are interested in manager-controlled process development. And new, small vendors keep popping up.

The changing nature of the software market is one cause for the continuing emergence of new entrants. The early BPMS tools were all based on client-server designs. A few years later vendors began to shift to SOA designs, and recently they have shifted to Cloud designs. In a similar way, the BPMS market has shifted its focus from process flow to business rules to analytics. Each shift creates an opportunity for new vendors to rush in offering new products. The larger vendors acquire the best of the new entrants and begin to incorporate the new technologies in their already complex products, and meantime some of the new vendors grow rapidly because they offer a particularly good approach to the latest problems. As we said, the BPMS market has been and remains very dynamic.

In addition to all the very real transitions in the market analysts have introduced some pseudo transitions that don't amount to much. Thus, for example, Gartner would have readers believe that there are now BPMS tools that focus on case management and "intelligent BPMS." Given that there is next to no market for "intelligent BPMS," this is nonsense. The reality is that the BPMS market is relatively small and every vendor is going after every opportunity it can find. The reason Gartner is now talking up case management and "intelligent BPMS" has more to do with Gartner's marketing concerns than with the realities of the BPMS market.

For many reasons the BPMS market continues to develop and will grow more complex in the years ahead. The market for BPMS products is largely gated by just how mature the BPM of user organizations is. As those organizations continue to learn more about the process-centric approach and to adopt it, they will in turn look for integrated BPMS products and the market will continue to expand.

Creating a BPMS Application

There is to date no widely accepted methodology for BPMS application development, although some vendors offer their own suggested procedures. In part, this is because BPMS is new and few companies have developed enough BPMS applications to have a good understanding about what works best. In addition, as we have suggested, there are in fact a number of rather different products all going under the BPMS label. Thus the approach one might follow to develop a human-centric BPMS application (workflow) is different from the approach one might follow to create an integration-centric BPMS application (EAI) or a decision-centric BPMS application (rules based). Some companies model and redesign their processes using conventional business process modeling tools and then move the application over to a BPMS environment for runtime execution, while others develop their own BPMS tools directly. There's little consistency and no one has enough experience.

Stepping back from specifics we can offer one very important piece of advice. Don't start a BPMS project until you are sure that the process you intend to manage using a BPMS application is already running as you want it to run. In other words, do not try to combine a process redesign project with a BPMS application development project. Both types of projects are demanding and require different skill sets, and combining them is a recipe for failure. Redesign or improvement can be done using the techniques we described in Part II of this book. Once you have processes you are happy with consider setting the process up in a BPMS environment for day-to-day management and execution.

Getting a BPMS application up and running is an IT implementation project. The problems we have heard about are classic software development problems and have little to do with process work as such. Companies have had trouble getting the infrastructure right. Companies have developed applications in one tool and then realized that the application wouldn't scale to support the number of transactions they wanted to run on a daily basis, and so forth. As we have suggested, companies are still learning about BPMS, so don't attempt to automate an application that you can't afford to have fail. Get some experience with BPMS before you attempt anything too challenging.

With all these qualifications in mind, imagine a world in which your major business processes are defined using process modeling and you could literally watch them flow through the different activities your application was designed to monitor. You could notice bottlenecks as they began to occur, you could change business rules, and watch how they changed the activities that were taking place. BPMS offers a world in which processes are more central and better managed than ever before. It offers a world in which managers can observe the work being done and change the process as needed in something close to real time. They are a solution to lots of the demands that today's managers face. Leading companies are investing in BPMS because they see its potential and want to use it to gain competitive advantage over their rivals. In a decade's time we expect BPMS applications to be as widely used as ERP applications are today. The trick in the meantime is to plan your transition to this technology.

Notes and References

We have published an extensive article on how to evaluate process modeling tools. It is available at http://www.bptrends.com (search for Evaluating Process Flow Modeling Tools).

IBM's BlueWorks Live is available at http://www.ibm.com. Readers can download a free trial version if they want to experiment with it. It is part of IBM's BPM Suite, which we will consider in more detail in the next chapter, but it is sold separately so it also competes in the modeling tools market. We could have used any of a dozen tools to illustrate how a modeling tool works, but we chose this one because it is one of the leading products in the market and because readers can readily get it to examine if they wish.

We picture a screenshot from Future Tech System's Envision process modeling tool that supports the various diagram types described in this book—including stakeholder and scope diagrams and BPMN diagrams. Moreover, the tool is repository based so once information is entered for one diagram it can easily be reused. More information about Future Tech System's Envision is available at http://www.futuretec.com.

We used a screenshot from Fluxicon's Process Mining tool to illustrate the use of process mining. More information on this tool is available at http://www.fluxicon.com also check http://www.BPTrends.com for articles by Anne Rozinat.

A good book on process mining is van der Aalst, Wil, *Process Mining: Discovery, Conformance and Enhancement of Business Processes*, Springer, 2011.

BPTrends has written a report that describes the popular elements of BPMS products. The report is free and available at http://www.bptrends.com (search for Evaluating BPMS Products).

A list of many popular and open-source BPMS tools is maintained by the International BPM conference group. It is available at http://bpm-conference.org/bpt-resource-management/.

There is ambiguity about the phrase *business process management.* Executives tend to use it in a generic sense to refer to managing processes. People in the workflow and XML business process language area often use *BPM* and *business process management* as synonyms for BPMS to refer to systems that automate business processes. Also keep in mind that some people will use workflow or EAI as synonyms for BPMS.

Dumas, Marlon, et al., *Fundamentals of Business Process Management*, Springer, 2013. A book providing a lot of detail on the functions and capabilities of BPMS tools.

Smith, Howard, and Peter Fingar, *Business Process Management: The Third Wave,* Meghan-Kiffer, 2003. This book kicked off the current interest in BPMS tools and applications. It's a bit over the top, but it presents the case for BPMS with lots of enthusiasm.

Khan, Rashid N., *Business Process Management: A Practical Guide*, Meghan-Kiffer, 2005. Of the books published that have sought to explain BPMS products this is the one I think offers the most practical and straightforward presentation.

White, Stephen, "Using BPMN to Model a BPEL Process," *BPTrends*, March 2005. This paper on trends in business processes walks us through the way BPMN can be used to generate BPEL, the language underlying some BPMS products.

Owen, Martin, "BPMN and Business Process Management," *BPTrends*, March 2004. This paper on trends in business processes discusses the use of BPMN for BPMS development.

Rosen, Michael, "BPM and SOA: Where Does One End and the Other Begin?" *BPTrends*, January 2006. Mike Rosen has written a series of articles on trends in business processes describing the relationship between BPM and SOA. This is the article where he introduced the diagram depicted in Figure 15.10, but all of the articles are worth reading.

There are no books that really describe a methodology for BPMS development. Derek Miers has published two papers on trends in business processes that suggest what such a methodology might look like:

Miers, Derek, "Keys to BPM Success," *BPTrends*, January 2006.

Miers, Derek, "Getting Past the First BPMS Project," *BPTrends*, March 2006.

Chappell, David, "Understanding BPM Servers," *BPTrends*, January 2005. This is a nice summary of how Microsoft is approaching BPMS with its BizTalk Server.

The International Conference on Business Process Management is a yearly event at which researchers gather to explore the inner workings of BPMS technologies. Each year the conference publishes its proceedings via Springer under the general title *Business Process Management*. If you are interested in technical issues involved with BPMS these technical papers can be useful.

The web address of the Workflow Management Coalition (WfMC) is http://www.wfmc.org. The WfMC was founded in 1993. It's a consortium of major workflow users and workflow vendors. The WfMC meets frequently to discuss key workflow issues and has developed a number of workflow standards.

Moore, Geoffrey A., *Crossing the Chasm*, HarperBusiness, 1991.

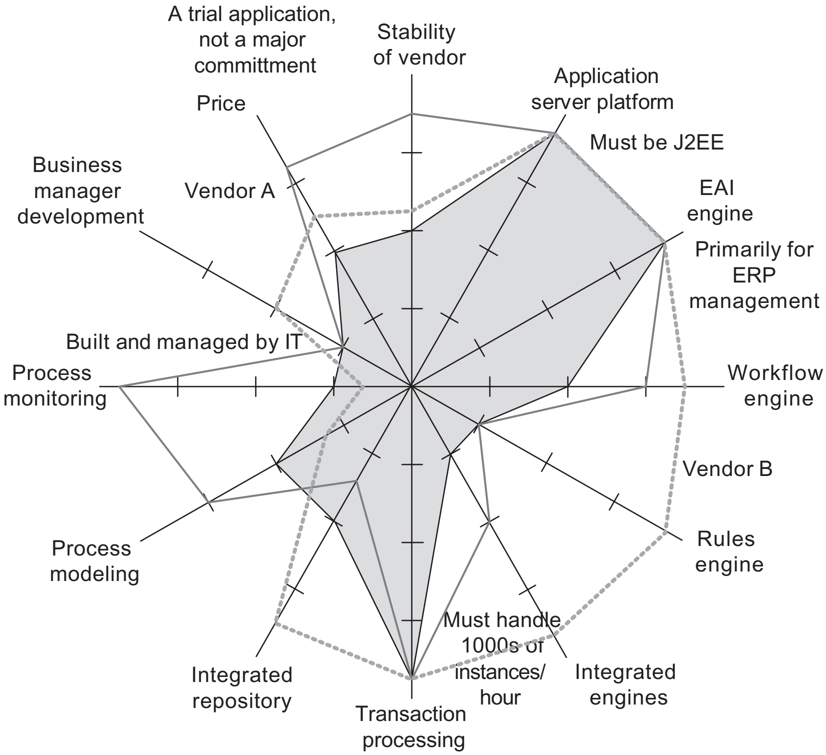

FIGURE 15.10

Radar diagram comparing two products.

A search for BPMS on http://www.bptrends.com will generate a large selection of articles. This field is changing very rapidly and new articles are being published each month.

Swanson, Keith D. (Ed.), *Mastering the Unpredictable*, Meghan-Kiffer, 2010. A good introduction to case management and the evolution of tools designed to deal with dynamic processes.

CHAPTER

Enterprise resource planning–driven redesign 16

In the 1990s many companies installed off-the-shelf applications from a variety of companies, including SAP, PeopleSoft, Baan, J.D. Edwards, and Oracle. Initially, these vendors stressed that they sold applications that performed certain common tasks that companies faced, like those in accounting, inventory, and HR. Later, in response to widespread interest in business process improvement these same companies began to reposition themselves. They developed templates or blueprints that showed how groups of their modules could be linked together to create business processes. In line with this transition people began to refer to these groups of applications as enterprise resource planning (ERP) applications, and recently some have added customer relationship management (CRM) applications and manufacturing applications. In essence, the vendors introduced a layer of enterprise application integration software or workflow that allowed companies to specify or modify the flow of control from one ERP module to another.

One leading advocate of this approach is Thomas Davenport, one of the consultants who had kicked off the business process reengineering movement in the early 1990s. In 2000 Davenport wrote *Mission Critical: Realizing the Promise of Enterprise Systems*. He argued that a packaged application approach allowed companies to integrate and improve their software systems. He was careful to qualify his argument and say that the use of software worked only within a broader business process architecture, but when implemented in such a context Davenport believed that packaged applications could help a company to rapidly integrate diverse processes.

In the course of the last decade or so J.D. Edwards was acquired by PeopleSoft, which was in turn acquired by Oracle. Meanwhile, Microsoft entered the market and began developing packaged software for smaller companies. In 2004 all the ERP vendors combined made around $50 billion. In 2018 SAP, the largest ERP vendor, earned a little over $26.4 billion. Obviously, the ERP market is much larger than the early business process management suite (BPMS) market. At the same time, however, many companies are unhappy with the installation problems and maintenance costs of their ERP software. One of the major drivers of BPMS development has been the hope that it will make it easier to manage ERP. Thus, although BPMS is just beginning to gain momentum, it seems likely that in a few years ERP and BPMS vendors will find themselves merging or competing to offer companies more flexible business process solutions.

Business Process Change. https://doi.org/10.1016/B978-0-12-815847-0.00016-9

Processes, Packages, and Best Practices

Vendors such as SAP, PeopleSoft, and Oracle often refer to their applications as "best practices." They argue that they developed their modules after studying what worked best at several companies and that the modules represent very efficient ways of handling the processes and activities they support. In fact, of course, these modules represent "average practices." In many cases they are an advance on the applications that companies had before, but once a company decides to use SAP, Microsoft, or Oracle modules in their HR department, then their HR processes will be the same as those of their competitors who are using the same modules from these same vendors.

Compared with the business process improvement approach we have advocated throughout this book the use of ERP applications occurs in reverse order. In effect, you begin with a solution—a new inventory application from SAP—and proceed to modify your existing inventory process to accommodate the inputs and outputs of the new inventory application. It is still possible to begin by analyzing the existing process, substituting the new SAP module or set of modules during the design phase, and then making the adjustments necessary to use the modules effectively. But the heart of this kind of ERP redesign effort is to accommodate the way your company works to the ERP application and not the other way around.

We think ERP applications represent a reasonable approach to improving a wide variety of business processes. If the processes are easy to automate and add little value to your overall business, then there's no reason why you shouldn't simply rely on efficient, average solutions, and focus your energies instead on core processes that do add significant value. Let's face it, managing payroll deductions or handling an office inventory database are enabling processes that need to be done, but they rarely add anything to the bottom line.

The problem comes when companies try to use ERP applications for tasks that are not routine and decide to tailor them to better fit with the way their company does business. The various ERP applications are essentially database applications; they manage database operations. Each of the ERP vendors has its own favorite database, and it's very hard to modify the internal workings of ERP applications once they are installed. If your company acquires a payroll application and then decides to tailor it you will find that the value of buying an off-the-shelf application diminishes rapidly. Moreover, the maintenance costs will rise in the future. When new versions of the ERP application are released they won't work at your organization until the new ERP modules are modified to match the previous modifications you made. If you find yourself considering ERP applications, and simultaneously planning to make lots of modifications in the ERP applications you buy, you are probably making a mistake. If the process is really a routine process and adds little value it's probably better to change your workflow and use the application in its standard version. If you really can't live with the vanilla version of the ERP application, then you ought to ask yourself if you really want to buy an ERP application in the first place. (We'll return to this problem later in this chapter.)

There are vendors that sell applications or develop applications that offer more flexibility than standard ERP application and in the long run don't cost as much if you want a highly tailored application or know you will want to change the application frequently. On the other hand, of course, these applications will probably not integrate with other modules as well as the standard ERP modules do, and that will add to the cost of more specialized applications.

ERP vendors have recently experienced problems as companies have begun to rely more on the Internet. Most ERP applications were designed to be self-contained systems, tightly linked with and relying on a proprietary database management system. ERP systems were not designed to support distributed data management. Most aren't especially good at working with other ERP applications, and they were totally unprepared when companies began to want to integrate applications into web portals or into supply chains that communicated over the Internet. In the past few years most ERP vendors have redesigned their systems and have begun to release new ERP applications designed to communicate via the Internet. In most cases, however, this adds another layer of complexity to the problems of integrating applications into e-business systems.

A Closer Look at SAP

Let's take a closer look at SAP, the dominant ERP vendor. SAP provides overviews, which it calls *business maps*, of processes that it offers in a number of industry-specific areas. Specifically, it offers business maps, or what we would call *process architectures*, in each of these areas:

Discrete industries	
• Aerospace and defense	• Engineering and construction
• Automotive	• High tech
Process industries	
• Chemicals	• Oil and gas
• Mill products	• Pharmaceuticals
• Mining	
Financial services	
• Banking	• Insurance
Consumer industries	
• Consumer products	• Retail
Service industries	
• Media	• Telecommunications
• Service providers	• Utilities
Public service	
• Health care	• Public sector
• Higher education and research	

SAP telecommunications business architecture						
Enterprise management	Strategic enterprise management	Business analytics	Business intelligence and decision support	Accounting	Workforce planning and alignment	
Customer relationship management	Marketing and campaign management	Sales management	Dealer management	Customer and retention management	Customer care	
Sales and order management—standard products	Product selling	Contract management	Order management	Service activation		
Sales and order management—customer solutions	Sales cycle management	Site survey and solution design	Contract management	Project management	Order management and fulfillment	Provisioning
Service assurance	Service agreements	Customer trouble reporting	Customer trouble management	Trouble resolution		
Customer financials management	Credit management	Prebilling	Convergent invoicing	eBPP	Receivables and collections management	Dispute management
Supply chain management	Supply network design	Demand and supply planning	eProcurement	Production planning and execution	Supply chain coordination	Warehouse management
Network lifecycle management	Demand planning	Requirements planning	Investment management	Network design and build	Operation and maintenance	
Value-Added services	Content and intellectual properties management	Advertising management	Mobile business and wireless ASP	eLearning		
Business support	Human resources operations sourcing and deployment	Travel management	Financial supply chain management	Treasury/Corporate finance management	Real estate	

FIGURE 16.1

SAP telecommunications business architecture.

Figure 16.1 illustrates one of SAP's business maps. In this case we have illustrated SAP's telecommunications business architecture. On the left side SAP lists the functional areas or in some cases large-scale business processes. On the right, in each row, are the processes included in the general category listed on the left.

Thus one functional area is service assurance, and there are four SAP processes under that function heading: *service agreements*, *customer trouble reporting*, *customer trouble management*, and *trouble resolution*. Figure 16.2 shows the specific SAP components or application modules that are used to implement (automate) each process.

Notice that, although the various components have different names, they often have the same component number. This suggests that the components are in fact subcomponents or modules of larger SAP applications, or that they rely on the same database for stored information. As we suggested earlier, SAP has reengineered its software applications to move them from a client–server architecture to a component architecture, and the original design often shows through.

We illustrated SAP's telecommunications business architecture so you can compare it with the eTOM business framework developed by the TeleManagement Forum, which is pictured in Chapter 4 as Figure 4.25. The eTOM architecture was developed by a task force of telecommunications managers and uses terms that are

SAP telecommunications business architecture					
Service assurance	Service agreements	Customer trouble reporting	Customer trouble management	Trouble resolution
SAP components available	- Service contracts (C17) - Service level agreements (C17) - Service event management (C17)	- Capture of customer trouble ticket (C17) - Diagnostic engine to aid resolution (C6, C17) - Call management with front-end close support (C17) - Site visit scheduling (C17, C5) - Internet trouble self-service (C17)	- Work request management (C17, C5) - Workflow-based execution and exception management (C5, C17) - Correlation of customer troubles to network troubles (Future) - Trouble ticket reporting	- Sophisticated diagnosis engine (C17) - Field/Mobile service (C17) - Work dispatching/ scheduling (Future) - Material/Spare part management (C6, C8) - Capture of resolution data for future diagnosis (C17)

FIGURE 16.2

SAP components used to implement the four processes under service assurance.

probably more familiar to those in the telecommunications industry. The SAP architecture was also developed by a telecom industry group organized by SAP. The resulting framework uses more generic process names since it relies on existing SAP modules whenever possible. In addition, keep in mind that the eTOM architecture was designed to describe a set of processes that might or might not be automated at any given telecom company. The SAP architecture, on the other hand, only lists software components that SAP sells or plans to sell, or that an SAP-associated vendor sells. Each software component may be entirely automated or it may provide user interfaces, so that employees can use interface screens to monitor or control the processing undertaken by the component.

Figure 16.3 illustrates a different SAP business architecture—in this case the architecture for insurance. Notice how similar the lists of functional areas or large-scale processes are. Also, notice that functional areas near the top and bottom of the diagram describe processes that are very similar to those listed on the telecommunications business architecture in Figure 16.1. Once again, the insurance architecture was developed by industry representatives in conjunction with SAP, and as before it relied on standard SAP modules whenever possible.

If a company decides to work with SAP the SAP representative provides the company with a detailed description of the SAP business architecture and the processes making up each component and asks the company managers to choose which they want to use. Once a company has chosen the modules or processes they want to acquire they can tailor them by changing names to match the terminology already in use at the company or by changing the actual processes themselves to conform more closely to practices at the specific company. It's especially difficult to link SAP components to other components that you use at your company, or to mix modules from more than one ERP vendor.

Tailoring also takes quite a bit of time. More importantly, once an SAP process is tailored it's harder for the company to use new SAP updates. Before the company can install the updates the company must first tailor the updates to match the existing

SAP insurance business architecture					
Enterprise management	Strategic enterprise management	Business analytics	Business intelligence and decision support	Accounting	
Customer relationship management	Customer engagement	Business transaction	Contract fulfillment	Customer service	
Sales	Sales planning	Account and contract management	Acquisition and sales management	Commission management	Collections and disbursements
Claims	Claim notification	Proactive claims management	Claim handling and adjustment	Claims accounting	
Policy and product management	Market research	Product definition and administration	Policy management	In-force business administration	
Reinsurance	Reinsurance underwriting	Reinsurance claim handling	Reinsurance accounting	Retrocession	Statistics and reporting
Asset management	Asset allocation	Portfolio management	Portfolio accounting	Portfolio controlling	
Business support	Human resource operations sourcing and deployment	Procurement	Treasury	Fixed asset management	

FIGURE 16.3

SAP business architecture for insurance companies.

SAP modules you have already tailored. The cost of tailoring SAP applications rapidly eats into the cost savings that one hopes to get when one buys off-the-shelf software, and raises maintenance costs. A company gets the best buy when it acquires SAP modules and uses them without tailoring, or creates add-on modules that don't change basic SAP modules.

SAP is in the business of selling processes or components that are very similar. They have created some unique modules for each industry, but overall they still rely on the initial modules they introduced in the 1980s, which include core accounting, inventory, and HR functions. There's nothing wrong with using standard modules, but any business manager should realize that many competitors are also using SAP modules. Thus using an SAP process doesn't give a company a competitive edge, but simply provides the company with a clean, modern implementation of a software process.

So far we've looked at the business architecture view of SAP processes. Once you have settled on a specific component you can obtain a more specific process diagram. SAP uses diagrams from the ARIS product of IDS Scheer, which is now a division on Software AG. (The founder of IDS Scheer, August-Wilhelm Scheer, is a software engineering theorist who has written several books on business process modeling and software development.) Software AG's annual conferences titled *Process World 200x* are major events in Europe and North America and provide a good overview of the ERP-driven approach to business process improvement.

Figure 16.4 provides a process diagram of a process used by a car retailer. The diagram begins at the top of the page and flows down.

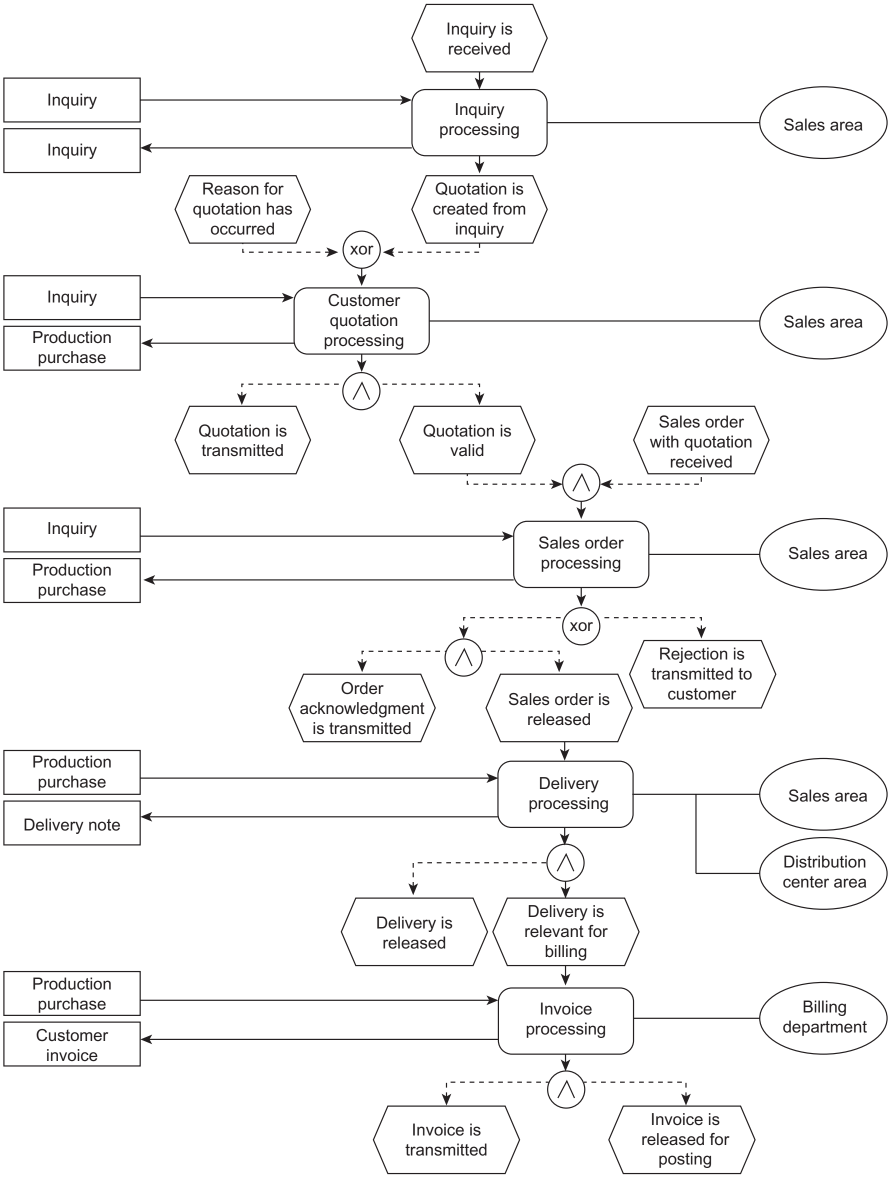

FIGURE 16.4

SAP/ARIS diagram of a new *car sales* process.

The rectangles with rounded corners represent activities. The six-sided boxes represent events or decision outcomes that occur during the process. The small circles represent decision points or describe the logic of a flow. Thus the circle with ^ represents AND. If two events are joined by an AND, then both must occur before the next process can occur. (The circle with XOR inside represents exclusive OR, which means that one or the other must occur, but not both.) The person or department responsible for the processes appears at the right in an oval. On the left, in thin rectangles, are documents that are accessed, modified, or stored in a database.

SAP is widely used, and thus there are lots of programmers who understand and use ARIS process diagrams like the one shown in Figure 16.4. In addition, ARIS supports a number of other diagrams, including one that has swimlanes and is more like the diagrams we have been using in this book. The diagram in Figure 16.4, however, is the standard ARIS process diagram.

Figure 16.5 presents the same information that is shown in Figure 16.4 using the process diagram notation we have used in this book.

As can be seen in Figure 16.5 there is a clearer distinction between events that a customer performs, documents that are inside the sales system, and events that define the flow of information in the process. By simply scanning along a swimlane, one can quickly see all the places the retail dealer interacts with the customer. Similarly, using other swimlanes one is provided with a better idea of who is responsible for which activities. Note that all the activities pictured in Figure 16.5 are mixed employee/IT activities. In other words, in each case an employee must enter information into the sales database from a personal computer.

We have omitted most of the logic flow notation. In some cases we show two arrows arriving at a box. Our diagram does not tell us if both inputs are required, if either one is sufficient to start the process, or if both are required before the process starts. We could easily add this information by inserting symbols inside the diamonds on our Business Process Model and Notation diagram. Most managers making a high-level process diagram don't care about this level of detail, but this is definitely an issue that software developers must resolve before they can develop software. However, they are issues that managers often ignore when they are defining business processes.

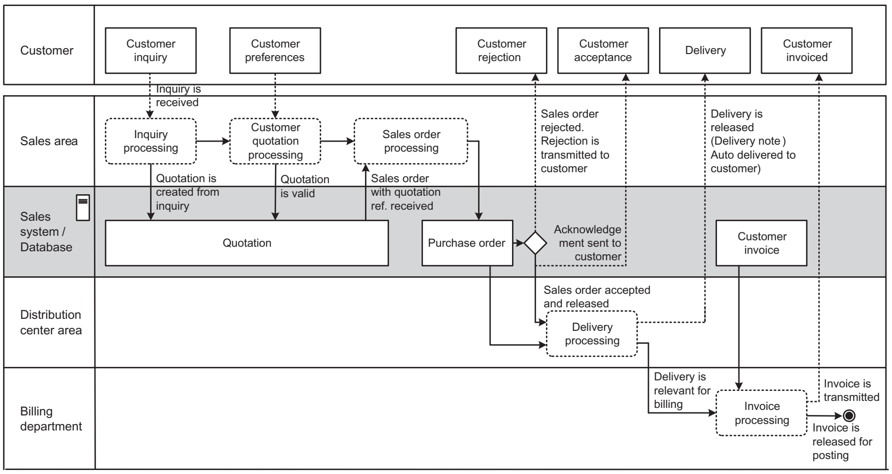

FIGURE 16.5

Retail car sales process in our notation.

The process notation used in the SAP reference model by ARIS is designed to tell its users more about control flow between processes. On the other hand, it doesn't emphasize the relationship between the process and the customer, or make it clear who is responsible for what activities. As a strong generalization the diagrams we use are better for managers who want to analyze and design business processes. The diagrams produced using ARIS methodology are better suited for software developers tasked with implementing a system that relies heavily on the management of documents that reside in SAP systems.

Figure 16.6 illustrates another type of SAP diagram. In this case an e-business process that relies on the Internet to pass information between three parties—customers, an insurance company, and companies that repair cars—is illustrated. The processes or activities are shown in six-sided boxes. The flow is indicated by the fact that some boxes abut others.

SAP calls the diagrams shown in Figure 16.6 C-business maps, which stands for collaborative business maps. In essence, this is a special kind of ARIS diagram to illustrate simple e-business interactions.

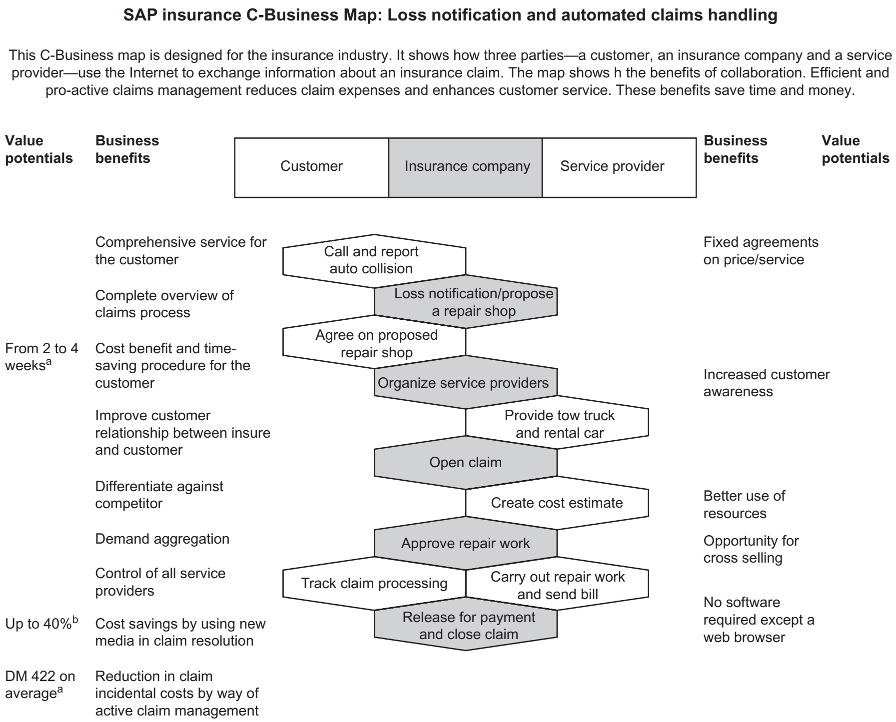

FIGURE 16.6

SAP C-business map of an Internet-based *auto claims* process. [a]German insurance company; [b]Diebold deutschland GmbH.

From SAP diagram of an insurance process.

What we like best about Figure 16.6 are the business benefits and value potentials that SAP includes on the right and left sides of the basic diagram. In essence, SAP lists reasons why specific activities will save or make companies money. When they have specific data they indicate them as a value potential, and usually add footnotes to indicate the source of the data. Thus, in the example in Figure 16.6 we see that SAP predicts that approving auto repairs online will result in cost savings, and suggests that Diebold Deutschland saved 40% of the cost of the activity.

All the business architectures and C-business maps are available at http://www.sap.com (SAP's website). SAP offers collaborative business maps in CRM, supply chain management, product life cycle management, e-procurement, marketplaces, financials, and HR. The kinds of benefits SAP lists are most reliable when a company implements a standard process. Little data are available on the more industry-specific processes, which emphasizes that the ERP-driven approach is usually best employed when a company wants to automate processes where the logic is relatively simple and where the processes don't add much strategic value.

Implementing an ERP-Driven Design

In a review of ERP implementation efforts the Gartner Group argued that the most important thing is the training of end users. This follows directly from the nature of the business process redesign efforts that are driven by ERP applications.

In essence, you begin with an architecture and choose components to use. Then you turn to specific process sequences and choose specific activities to implement. As a result you have selected a whole set of processes and activities that you intend to install at your company with a minimum of changes. Some activities will be fully automated, but most of the activities you select will require that employees learn to use interface screens on PCs to enter or retrieve information from the SAP databases that form the core of any SAP system. That may sound simple, but in fact depending on what your employees are doing now you will need to teach employees an entirely new process.

Consider an auto dealer that used a less sophisticated system. The salespeople talked with customers and eventually filled out a form, which they then used when they phoned to see if a car with the desired characteristics was available. At some point, assuming the car was available, the salesperson would negotiate a price and then take a brief break to get the manager's approval of the deal being struck. The order in which the salesperson performed those tasks and the verbal exchange with the customer, while all the details were being attended to, was probably quite specific to individual salespeople. Once the SAP system is installed our salesperson is going to have to learn to carry on his conversation while entering information into a computer. The SAP system assumes that the manager approves online and that the supplier determines the availability of the car online, and so forth. It's probably going to take quite a bit of training before the salesperson feels comfortable with the new process. And the auto example is relatively simple, since it largely follows the sales process already used in auto retail showrooms. Other processes that rely on the use of databases can rearrange the steps in an established process in a much more confusing manner.

SAP is not the only ERP vendor that offers architecture and business process diagrams. Oracle and Microsoft both have something similar. Figure 16.7 illustrates a process map developed by Siebel and IBM to show how Siebel's CRM software could be organized with IBM's BPMS WebSphere software.

Most companies begin with an analysis of their As-Is process. Then they "overlay" the ERP modules they intend to install, eliminating the subprocesses and activities that the new ERP apps will replace. What one obtains is a new diagram with lots of disconnects. Interfaces to the ERP applications are PC interface screens (links to database documents). The trick is to create a new To-Be diagram that ties each of the existing activities that remain to ERP modules that have been inserted. Once you have done that you need to review which employees will be doing what tasks and revise job descriptions accordingly. And then you must provide the training necessary to ensure that people can do their new jobs.

One technical problem involves the "translation" of diagrams. We recommend using the types of process diagrams we have introduced in this book. These diagrams make it easier for managers to see how processes work and who is responsible for what activities. Thus to "overlay" a set of SAP activities you need to do a translation of the SAP diagram along the lines illustrated in Figure 16.5. This probably isn't something the redesign team should attempt, but something that the facilitator or someone in the IT department should be able to do for the team.

Figure 16.8 illustrates a sales order system that relies on two different ERP modules. The ERP Sales Quotation application is essentially an application that checks an inventory database to determine whether ordered items are in stock. The ERP Sales and Distribution application is an application that creates a printed bill of lading. The sales order system is an automated system that could be on a company portal, or it could simply be an application that is accessible online to retailers who sell your company's products.

In this example we've shown some of the activities that occur inside each ERP application. In most cases we would simply have a single process box to indicate each ERP application. The people working on the process really don't need to know exactly what goes on inside ERP applications. What they need to know is what inputs they need to make, what outputs are made, and who has to process the inputs and outputs. In this example, since the customer is interacting with an automated system, inputs to ERP applications are made by the sales order system, which is itself a software system. If this system replaces a process that involved employees, then appropriate changes would be required. The output of this process is a request to shipping (a bill of lading) to send an item to a customer. Shipping needs to know how to accept such an order and how to handle it. Assuming employees are working in shipping we

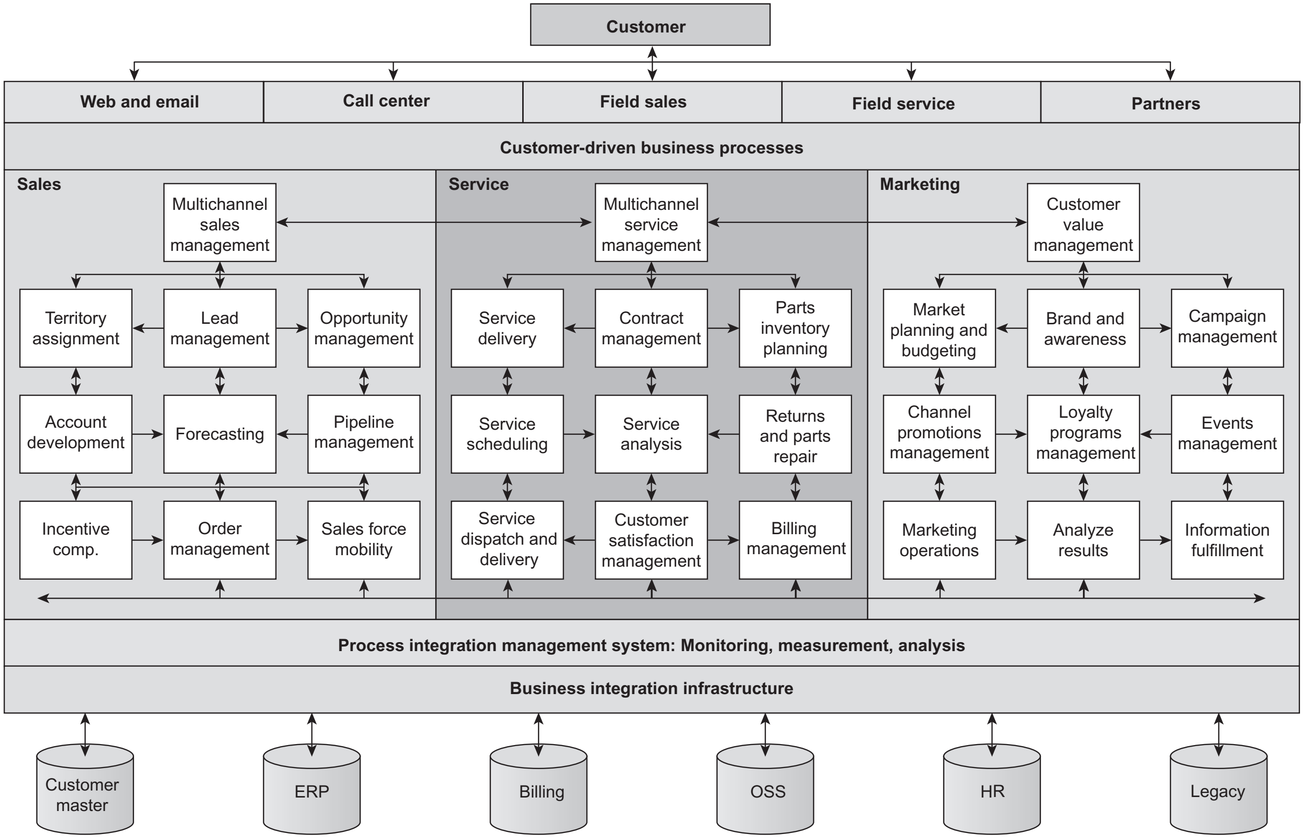

FIGURE 16.7

IBM and Siebel architecture for customer relationship management.

From a report from IBM and Siebel.

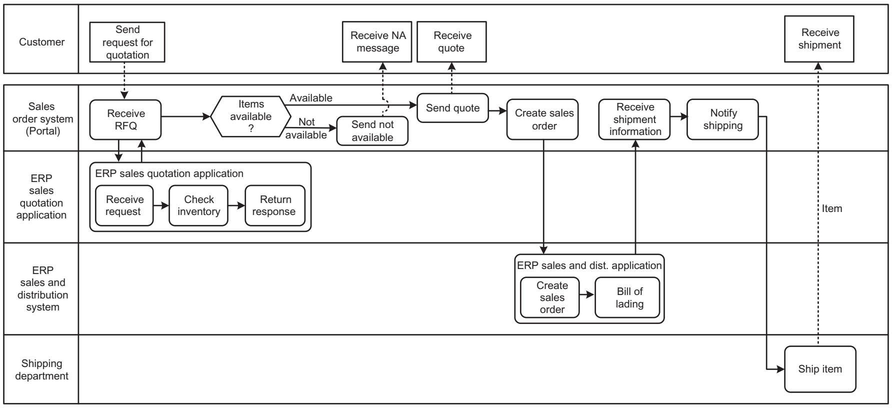

FIGURE 16.8

Process that interfaces with two enterprise resource planning applications.

would probably want to do another process diagram to define just what happens in the *ship item* subprocess.

The main point here, however, is that you can create swimlanes for ERP applications and indicate how the ERP applications interface with existing process flows. Preparing the transition to the use of ERP applications means understanding exactly how the ERP applications will interact with your existing processes, and then training your people to handle the ERP inputs and outputs when the system is implemented.

Before we discussed ERP-driven redesign we considered workflow. In essence, ERP systems are also workflow systems. Instead of designing a unique workflow system with a workflow tool, one simply chooses ERP components or processes to assemble into a system. Underneath, however, the ERP vendor provides a workflow engine that passes control from one component or process to the next. An IT manager can use the ERP management system to exclude specific documents from a particular process or to quickly modify the order in which processes are used. By combining precoded processes with workflow, companies gain considerable control over basic processes.

Case Study: Nestlé USA Installs SAP

A good example of a company that used ERP packages to reorganize their business processes is provided by the US subsidiary of Nestlé SA, a Swiss food conglomerate. Nestlé USA was created in the late 1980s and early 1990s via acquisitions. In 2002 it included seven divisions, which collectively sold such popular brands as Alpo, Baby Ruth, Carnation Instant Breakfast, Coffee-Mate, Nescafe, Nestlé Toll House, Power-Bar, Stouffer's Lean Cuisine, SweeTarts, and Taster's Choice. In 2002 the company employed some 16,000 employees and earned about $8 billion in revenues.

In the mid-1990s the various companies that make up Nestlé SA were all operating as independent units. In 1997 a team studying the various company systems concluded that collectively the companies were paying 29 different prices for vanilla—which they all purchased from the same vendor. The study wasn't easy, since each company had a different number or name for vanilla and purchased it via completely different processes. Simply isolating vanilla and determining a common unit price required considerable effort.

In 1997 Nestlé USA decided that it would standardize all the major software systems in all its divisions. A key stakeholder team was set up to manage the entire process. By March 1998 the team had its plan. It decided it would standardize on five SAP modules—purchasing, financials, sales and distribution, accounts payable, and accounts receivable. In addition, the stakeholder team decided to implement Manugistics' supply chain module. The team considered SAP's supply chaining module, Advance Planner and Optimizer, but it was brand new in 1997, and they decided to go with the better known Manugistics module that was specifically designed to work with SAP modules.

Before even beginning to implement SAP modules people from the divisions were gathered and spent 18 months examining data names and agreeing on a common set of names. Vanilla, for example, would henceforth be code 1234 in every division.

Somewhere along the line the project to install SAP modules also became a Y2K program. By moving to standard software that was guaranteed to be free of bugs associated with date problems that might occur when applications started dealing with dates subsequent to December 31, 1999, the companies would avoid any Y2K problems. Unfortunately, this placed a deadline on the entire implementation effort—it had to be done before January 1, 2000.

As the various SAP applications began to roll out to the divisions the stakeholder team managing the entire effort began to get lots of unpleasant feedback. Jeri Dunn, the VP and CIO of Nestlé USA, explained that in hindsight they had completely underestimated the problems involved in changing division cultures or modifying established business processes. By the beginning of 1999 the rollout was in serious trouble. The workers didn't understand the new SAP modules, and they didn't understand how the outputs they were now getting would help them do their jobs or manage the processes they were responsible for.

It was at a major meeting in early 1999 that Dunn was given responsibility for the project. Among the other conclusions reached by this executive committee meeting was that the Y2K deadline would be ignored. Henceforth they would figure out the implementation requirements for each SAP module and then let that specification guide their schedule. They decided that it was relatively easy to install SAP modules, but that it was very hard to change business processes and to win the acceptance of the people responsible for ensuring those processes operated correctly. They also decided that much more care needed to be taken to determine just how the SAP modules would interact with the processes and applications that would remain in place.

At the same time that Dunn took over a new director of process change was hired, and a process manager (VP) for the supply chain was promoted to help Dunn on the remainder of the project. In most cases the team now began to focus on modeling processes and defining process requirements and then creating a plan to install the SAP modules. Several installations were delayed for months or years to accommodate groups that were not prepared for the process changes required. As we go to press (2018) the Nestlé transition is coming to an end. The company spent approximately $200 million on the transition. Dunn claims that the project has already paid for itself. The new planning processes, for example, make it possible to project Nestlé USA–wide demand more accurately and to save significant inventory and redistribution costs. The VP for Nestlé USA's supply chain, Dick Ramage, estimates that supply chain improvements have accounted for a major portion of the $325 million that Nestlé has already saved as a result of the SAP installation.

Dunn says she's happy with the SAP applications and very happy that all the companies are now using the same basic processes. Still, in an article on the transition in *CIO Magazine* in May 2002, Dunn claimed that if she had it to do over again, she'd "focus first on changing business processes and achieving universal buy-in, and then and only then on installing the software."

Nestlé USA's use of ERP applications and their problems are typical of most large companies that have elected to rely on ERP applications to drive major changes. The company embraced ERP applications in hopes that they can organize and standardize their software applications and databases across departments and divisions. Most large companies have started on this path and found that it takes much longer and is more painful than they had expected. Few have completed their ERP transitions. The problem lies in the fact that ERP applications aren't a solution. They are a tool to use in changing business processes. This isn't something that IT can do by itself. The transition must be conceptualized as a business process transition and guided by business managers. ERP applications must be installed as part of the overall business process redesign effort, not as an independent activity. Used in an appropriate manner ERP applications offer a powerful tool to aid in business process redesign.

Using BPMS to Improve ERP Installations

Most large companies have installed packaged ERP and CRM applications in the course of the last decade. Some have installed the same vendor's ERP applications throughout the company, while others have installed a mix of packaged and best-of-breed applications. Figure 16.9 provides a very abstract way of looking at an ERP installation. Imagine a company that has a process with three activities. To automate the activities, or at least to support the employees performing the activities while simultaneously gathering data that can be provided to managers, the company decides to install an ERP system. To keep things simple the company buys all its ERP modules from a single company and thereby ensures that the modules will all talk to each other and will store their data in a common database, making it much easier

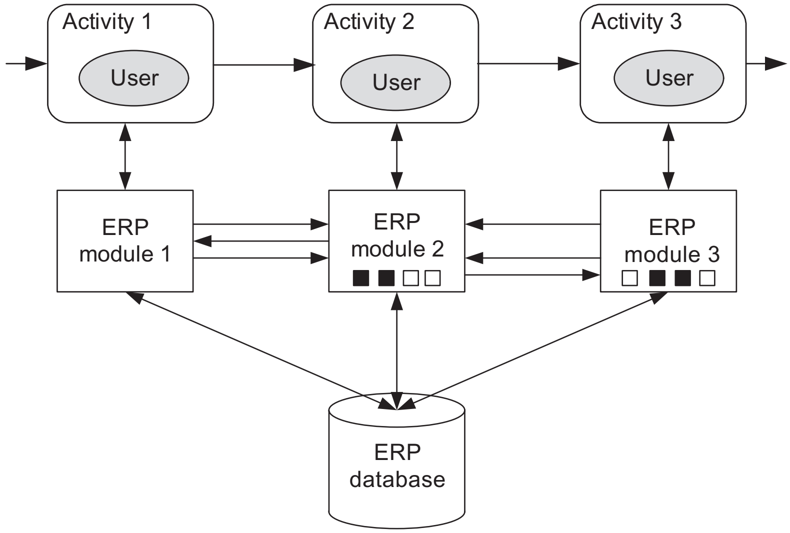

FIGURE 16.9

Enterprise resource planning modules support activities.

to generate reports. The vendor has three modules that support the three activities. Luckily, Activity 1 is so similar to the assumptions made by the corresponding ERP application that no tailoring is required. Unfortunately, both Activity 2 and Activity 3 include steps and flows that are performed differently from the way the two ERP modules normally handle them. Thus IT agrees to tailor the two ERP modules. We represent this with little boxes inside the modules, which we hope suggests some tailoring.

When the ERP application was finally rolled out—it took quite some time to tailor the ERP modules—everyone was happy. Later, however, when the ERP vendor moved from Version 2.0 to Version 3.0, Module 2 and Module 3 had to be tailored all over again. It didn't take long for the company to realize that it was going to have to keep paying and changing its ERP applications as each new version of the ERP software was released.

Unfortunately, the problem we have described is only the tip of the ERP iceberg. If the company involved is a large international company it probably rolled out ERP to its different branches and subsidiaries over the course of several years. Moreover, to keep everyone happy IT keeps tailoring ERP applications to support the local practices of groups in each of the branches and subsidiaries. Let's imagine that ERP Module 2 records sales data and that ERP Module 3 prepares a statement for the customer. The European division uses both ERP Module 2 and Module 3, tailored to their way of doing business. The Indian subsidiary and the Japanese subsidiaries also use ERP Module 2 and Module 3, but each tailored in a slightly different manner. In other words, when the ERP vendor moves from Version 2 to Version 3 the company is actually going to have to buy several copies of Module 2 and several copies of Module 3 and then tailor them to replace all the different versions of those modules it is using throughout the world.

Multiply this by a dozen different business processes and you have anywhere from dozens to hundreds of different ERP applications running in a large international organization. The costs of this approach can be staggering. Figure 16.10 highlights the ERP multiversion problem that most large companies face.

A quick glance at Figure 16.10 suggests that three different units all perform an activity that is rather similar—recording sales data in the case of Activity 2—and that huge savings could be achieved if all divisions and subsidiaries agreed to perform the same activity in the same way. Then the company could tailor one module to support the common activity and not have to support multiple versions of ERP Module 2.

Several companies have launched efforts to significantly reduce the number of different ERP applications they have to support. To do this they are turning from IT to the business units and creating enterprise-wide process managers. Thus, Company X now has a worldwide sales manager and a worldwide procurement manager, and so on. Each process manager is charged with creating a standardized process that will subsequently be supported by a single installation of an ERP application. Other benefits of enterprise standardization rapidly emerge as training is standardized, reporting becomes more consistent, and it becomes easier to move salespeople from one business unit to another, but let's stay focused on ERP.

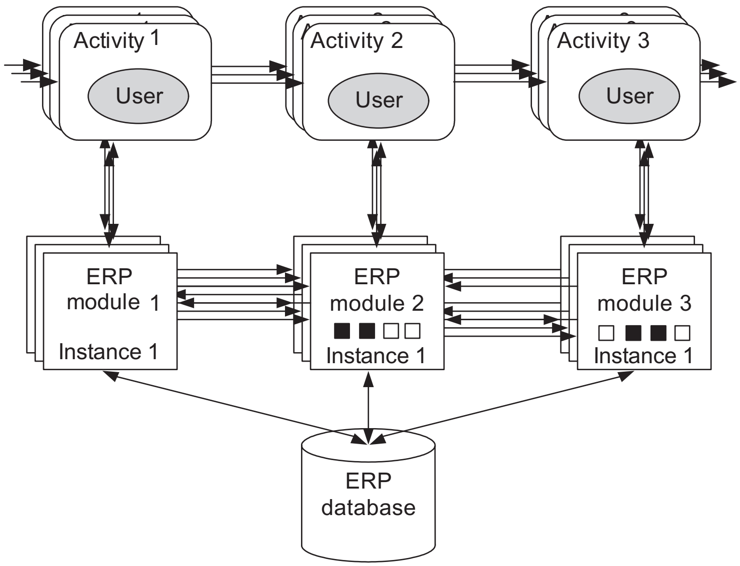

FIGURE 16.10

Multiple instances of enterprise resource planning supporting a variety of similar, but slightly different sales activities.

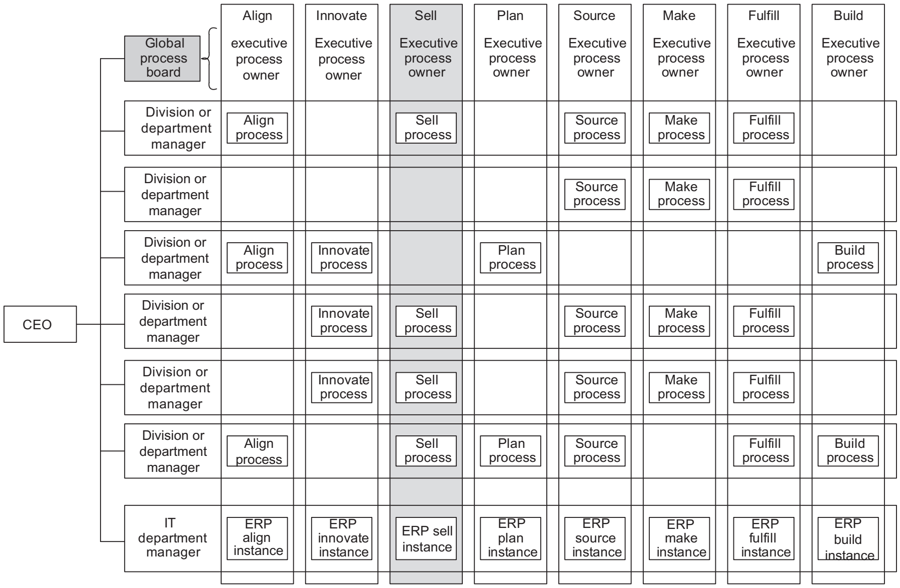

FIGURE 16.11

Company that has created process sponsors to standardize processes.

Figure 16.11 shows a matrix that was developed by a company trying to get control of its ERP applications. In this case we have placed the traditional organization chart on its side and have the CEO at the left rather than at the top. As you can see the company has created a global process board and identified one sponsor for each major process area. In fact, to get to the organizational structure shown in Figure 16.11 the company had to create a business process architecture and define its major business process area. Having done that and assigned process sponsors the sponsors then convened meetings that brought together managers from across the world. We've highlighted the sales process in Figure 16.11. The sales process sponsor held meetings with the sales managers from all the company's departments and divisions. Together they worked out a common sales process that each unit could follow.

Once the company's worldwide sales process manager pulls together people from all the business units, he or she will hear all the reasons why sales are different in Europe than in the United States or Japan. There is always some truth in these claims. But if one's goal is a company-wide process and it's backed by senior management it can usually be achieved, especially at a high level of abstraction. Once the process is standardized it is possible to configure a single installation of an ERP application to support the new standard processes.

We've been impressed by the number of CEOs who are determined to make this happen and by the results they are generating. In some cases the companies have had

ERP for years and are simply tired of the costs and problems associated with supporting multiple different versions of their ERP software. In other cases companies are just installing ERP, have learned from others, and are waiting to install ERP modules before they arrive at standard processes. They are determined there will be a single installation of an application. In either case the road to improving the ERP installation lies through enterprise process redesign and standardization. Figure 16.12 illustrates the goal of Company X.

When we first met CEOs and CIOs and heard these stories we began to worry that they were simply creating process silos that would be just as troublesome in a few years as the departmental and business unit silos they currently struggled with. Let's consider Company X. In Europe it sells large manufacturing equipment. In Japan it sells small commodity items. Surely the two types of sales are different. Remember how we discussed Porter in Chapter 2 and concluded that competitive advantage accrued only to companies that were able to integrate all the processes in a single value chain in the best possible way. Surely if one wanted to create a well-integrated value chain for large manufacturing equipment and another for the sale of small commodity items one would modify the sales process in different ways to integrate with and to support the different marketing and manufacturing processes.

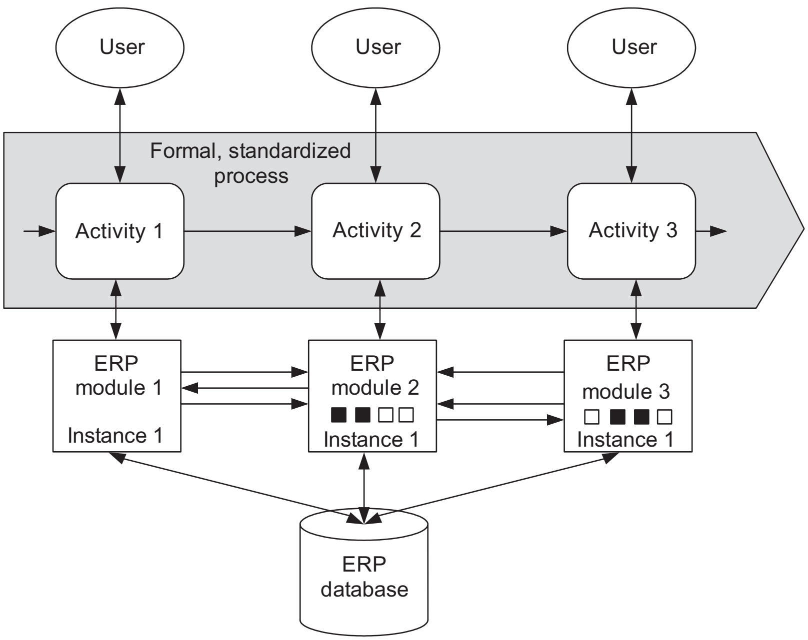

FIGURE 16.12

All business units are using the same process, which is supported by a single set of enterprise resource planning modules.

Enterprise Resource Planning and Business Process Management Suite

Without knowing it Company X is preparing to move to BPMS. They now have enterprise-level process managers and teams and they are now struggling with how to keep their simplified ERP structure, while simultaneously allowing different divisions to tailor their processes to better integrate with the overall goals of their specific value chains. A salesperson from one of the BPMS vendors explains to Company X that BPMS can provide the best of both worlds. The company can use a BPMS product to separate dependencies between ERP modules and to provide tailoring within the BPMS package, without having to tailor the ERP modules. At that point they will have a single installation of an ERP application and the ability to tailor specific processes.

Figure 16.13 illustrates where Company X may end up a few years after it has installed a BPMS package to manage its sales process. In this case the standard process has been defined in a BPMS product. Rather than tailoring ERP modules all the tailoring that needs to be done is done within the BPMS tool. We've represented these as activity boxes 1 and 2 in Figure 16.13. (Put more technically, one creates business rules within the BPMS environment that analyze and prepare data to be submitted

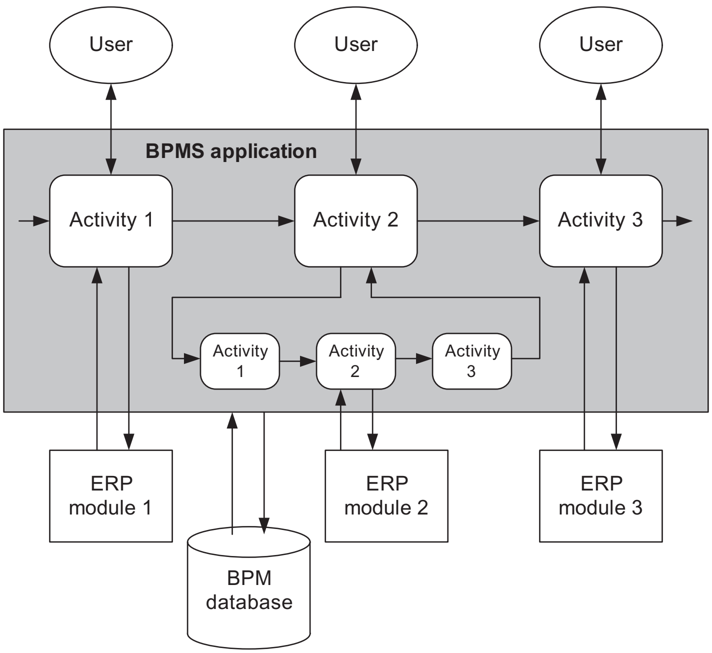

FIGURE 16.13

Business Process Management Suite product managing a set of enterprise resource planning modules.

to the ERP modules. As an added benefit, the ERP modules can be managed by the BPMS tool rather than compiled together. Thus, now the BPMS product manages ERP and allows the user to make changes rather easily, Company X can avoid the problems companies with large compiled sets of ERP modules now struggle with.) Company X may very well find that they can use the BPMS system to tailor their basic sales processes to support multiple value chains, while simultaneously maintaining a single installation of an ERP application.

In a completely rational world we might advise Company X to skip the phase they are in and move to a BPMS effort. In reality, however, BPMS is still a new technology and Company X's people are a bit too conservative to jump on a new technology. They are, however, very much aware of how much the multiple versions of ERP modules are costing them, and they are motivated to try and eliminate that problem. And they have figured out that they will need to control processes at the enterprise level to bring about a single installation of ERP. Thus Company X has moved into enterprise process work in a very serious way and is in essence preparing itself for more process work in the future.

We have been impressed with what we've seen. Many business process management (BPM) gurus in the 1990s urged companies to focus on enterprise process work and to assign enterprise-level process managers. In reality, most companies focused on specific process redesign efforts. Today, a surprising number of large companies have definitely moved beyond one-off process redesign efforts and are focused on process management and corporate-wide process standardization. It's a major step forward and will undoubtedly lead to even more interesting things in the future.

The scenario we have just suggested illustrates the problem that ERP vendors face. One of the most popular uses of BPMS software to date is to create process management systems that can manage ERP applications. By keeping ERP applications generic and doing any special tailoring in the BPMS application the company reduces its costs and increases its control and its ability to change rapidly. The company also gains the ability to mix applications from different ERP vendors, since the BPMS product can potentially manage whatever database the company wants to use and keep it independent of any particular ERP module.

This movement constitutes a clear threat to the dominance of the leading ERP vendors, and if it proceeds will significantly reduce the importance of ERP software at leading companies. ERP vendors have responded by seeking to generate their own BPMS solutions and offering them as alternatives to other BPMS products. Thus SAP is developing NetWeaver, Oracle is working on its own Business Process Management Suite, and Microsoft is developing its BizTalk server. Broadly speaking, each of these products is primarily an application integration tool. ERP vendors will have trouble matching what BPMS vendors can do because they are trying to support their existing installed base while simultaneously innovating, and that's hard for any software vendor. While the leading BPMS vendors support business processes with lots of employee activities, ERP vendors have traditionally focused on automated processes and will have to come up to speed with expanded workflow capabilities to match the capabilities of the best BPMS vendors. Similarly, ERP vendors have traditionally designed their products for IT developers, as the ARIS diagram we showed earlier suggests. ERP vendors will also have to rethink their entire positioning if they hope to create products with interfaces that are friendly enough to allow managers to modify processes.

From all we've said you might conclude that we don't think most ERP vendors will be able to transition and generate the kind of highly flexible BPMS applications that companies will be demanding in the next decade. In fact, we think it will be hard and we don't expect the small ERP vendors to manage it. The large ERP vendors—SAP, Oracle, and Microsoft—have enough resources and technical sophistication that they ought to be able to do it. Indeed, they are already making a major effort, and we expect them to intensify their efforts in the years ahead. Thus, although it is easy to think of ERP and BPMS as separate technologies, in fact they will merge in the years ahead. BPMS vendors will add application-specific knowledge to their products and ERP vendors will add BPMS engines to their suites. We expect some interesting mergers as ERP and BPMS vendors struggle to figure out how to create the best applications for their customers.

Notes and References

Davenport, Thomas H., *Mission Critical: Realizing the Promise of Enterprise Systems*, Harvard Business School Press, 2000. Having helped launch the BPR movement Davenport noticed that by the late 1990s many companies were implementing process change with packaged applications from ERP vendors. In his book he reports his investigations into the whole trend. When Davenport wrote the book he was the Director of the Institute for Strategic Change at Andersen Consulting. Davenport is now Director of the Business Process Institute at Babson College. More information is available at http://www.babson.edu.

The software and business process theorist who has dominated the ERP space is August-Wilhelm Scheer, Head of the Institut für Wirtschaftsinformatik at the University of Saarlandes in Germany. Scheer started by developing techniques for modeling software systems and founded IDS Scheer GmbH to promote his approach and sell the software tool ARIS. Recently IDS Scheer was acquired by Software AG. The ARIS approach is used by SAP, the largest packaged application software (ERP) vendor. Some of Scheer's books include the following:

Scheer, A.-W, *ARIS—Business Process Modeling* (3rd ed.), Springer, 2000. This book focuses on process modeling, especially as it is done with ARIS in SAP R/3. A book for IT developers, not business managers.

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CHAPTER 17

AI-driven process change

The world of business is clearly going to continue to change very rapidly. New technologies will be introduced each year, new tastes will become popular with consumers, and new business models will be developed that will challenge whole industries to come up with solutions to the disruption caused. Organizations will need to continue to change their business processes to accommodate these ongoing changes. If I had to pick a single technological change that I thought would have the largest impact on process work in the next few years I would pick the widespread adoption of artificial intelligence (AI) techniques. I believe that business and the nature of human work will be slowly but profoundly altered as companies and consumers incorporate AI techniques in their daily processes. In this chapter I want to define AI and consider some of the ways in which it will drive process change.

In a sense, of course, AI is simply today's cutting-edge computer technology. Thus, in a broad sense, all I am really saying is that organizations will continue to automate using the latest computing techniques. In earlier iterations, computer technologies took over the storage of data and most routine mathematical and bookkeeping calculations. Later, computers invaded the front office, replacing typewriters and offering automated spreadsheets for office workers. Other computer techniques have automated routine physical operations using robots, like those that assemble cars, and using software applications that have replaced most routine document processing work that humans formerly did. Computers have expanded their role from calculating to communication and now provide email and web services that enable constant, worldwide message flows and daily "meetings." AI techniques will automate most tasks that currently require human analysis and decision-making skills and many operations that involve linguistic or fine motor skills.

Artificial Intelligence

If you read business publications you have already read articles on AI or on one of the more specific AI techniques, such as cognitive computing, process mining, machine learning, automated decision making, robotic process automation, natural language processing, speech recognition, or intelligent agents. Clearly, AI isn't a single technology; instead, it includes a lot of different techniques that can be clustered in different ways to build different kinds of software applications. I'll try to provide an

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overview of both the technology and its possible applications in this chapter, placing a special emphasis on how AI technologies will affect the work of business process analysts.

For the past 20 years I have primarily focused on business process change following the success of this book, which was first published in 2003. During the 1980s and 1990s, however, I spent most of my time writing, speaking, and consulting on AI. My consulting in the 1980s resulted from a book I had written in 1985, *Expert Systems: AI for Business*. That book described an earlier iteration of AI. Recently I have been impressed by the latest developments in AI and their potential to revolutionize business processes in the near future.

Artificial intelligence (AI) is a term chosen by a committee at a workshop at Dartmouth College in the summer of 1956 to describe the branch of computer science focused on building computers that showed human-like intelligence. AI researchers asked how they might get computers to see, to speak, to ask questions, to store human knowledge, to learn new things, and to understand the importance of ongoing events. They also asked how they might get computers to guide machines that could undertake manipulations that ranged from surgery and walking to assembling complex devices and driving cars. Most of the emphasis has been on getting computers to identify patterns and to respond to new or unpredictable situations—as a human does when he or she meets a new person and enters into a conversation to learn about the new person.

AI is often said to be subdivided into several branches, including knowledge representation, natural languages, and robotics. Since that first AI conference in 1956 AI has experienced three periods in which commercial groups became excited about the possibilities of using AI techniques for practical applications. The first was in the late 1950s, just after the launch of *Sputnik*. The Russian success stimulated the US government to become very interested in what Russian scientists were doing. The US military became excited about the possibility of using AI techniques to translate lots of Russian documents into English. After a few years of experimentation it became obvious that the then current state of language translation wasn't up to the job, interest in AI died down, and funding dried up. This is not to say that research in computer science departments was discontinued, but only to say that there was no longer any interest in trying to develop commercial applications.

The second time people got very interested in AI was in the 1980s, when software applications called "expert" or "knowledge-based systems" seemed to promise that new software systems could be built that would capture and replicate the knowledge and analysis capabilities of human experts. This round of commercial AI activity was stimulated by a couple of applications built at Stanford that demonstrated human expertise. *Dendral* was a system that could infer molecular structures as a result of receiving information generated by a mass spectrometer. In effect, Dendral did something that had previously only been done by very skilled analytic chemists. (The systems that are used to analyze human genomes today are descendants of Dendral.) *Mycin* was a medical system that could analyze meningitis infections and prescribe treatments. Mycin did what only physicians who had specialized in meningitis diseases were normally capable of doing. Both systems proved in tests that they could perform as well as human experts at their selected tasks. On the basis of the results achieved by Dendral and Mycin, software companies were launched to create software tools designed to facilitate the development of other knowledge-based expert system applications. For several years large organizations invested in the technology and explored the uses of knowledge-based techniques.

Data, Information, and Knowledge

Words such as "data" and "information" are used in lots of different ways. To understand their meaning in a specific context you need to know how a specific speaker is using them. I try to use these words as they were often used in the mid-1980s in AI circles to make a point about where "big data" end and AI begins.

Here are my definitions:

- *Data* refer to specific items (e.g., x, y). Names or numbers such as 3.14159.
- *Information* refers to propositions (e.g., $x = y$, or $x > y$) that relate names or numbers. Thus the propositions that *3.14159 is an irrational number*, or *3.14159 is pi* are both examples of information.
- *Knowledge* refers to a rule or other statement (e.g., if $x = y$ and $n < m$, then do a) that combines propositions to recommend specific actions. For example, if you want to calculate the circumference of a circle you multiply its diameter by 3.14159.

Computer systems currently capture huge amounts of data. Some are captured as items, such as customer name, credit card number, items purchased, and amounts spent on purchases on structured forms. In these cases some information is implied and captured as the data are entered. Thus we create information by associating the customer name with the credit card number. Most data, however, are unstructured. They are captured as textual documents (such as emails to companies, or blog entries), as verbal items (like recorded phone calls), or as visual items (such as video recordings of customers entering a building or cars arriving in a parking lot). All these data are being saved in databases. When you consider the bits and bytes involved in unstructured text documents and verbal or visual recordings it's no wonder that captured data are growing rapidly.

In the very recent past turning even a small part of the unstructured data being collected into information would have been very expensive. You would have had to have an employee physically scan videos of employees arriving to determine what time a given employee arrived on a given day. Recent breakthroughs in text-reading software and visual-scanning software, however, are making it possible to quickly convert huge amounts of data into information at a modest cost. Making data into information is in itself valuable. Data can be converted into information that humans can then scan looking for useful patterns. Data analytic software can do it even more rapidly and often identify patterns that are more complex than humans would normally recognize.

What's more exciting is the use of AI to automate certain types of actions. Knowing employees tend to make a specific type of mistake on certain days is interesting, but knowing that taking a specific action will reduce the occurrence of the mistake is even more interesting. Knowledge, as I have already suggested, allows us to move from information to action. In the 1980s we explored the use of rule-based expert systems to deal with complex human decision making. The systems proved effective, but they also proved expensive to develop and very expensive to maintain. Today's new generation of AI applications is based on a different approach: neural networks and deep learning algorithms. In essence, the application generalizes a pattern from a number of trial runs during which humans provide the right answers. Once the machine is trained to identify the pattern it tends to get even better at recognizing the pattern with additional practice, which it can undertake on its own. Learning is key! By using today's AI applications, and training them as we train people, with examples, and by reinforcing correct responses, the systems can be developed more quickly and they can continuously improve, eliminating the need for expensive maintenance cycles.

> The essence of it is that we have huge amounts of data, and we now have tools that let us turn the data into information and still others that let us automate the examination of information and generate the knowledge needed to take appropriate decisions.
>
> This is only one way to use these three words, but its how a lot of AI people commonly use them, and I find it a very useful way to think about all this.

Several interesting knowledge-based systems were developed in the 1980s and some proved quite valuable. Ultimately, however, most of the knowledge-based systems that were developed in the 1980s proved too difficult to update and maintain. Human experts in cutting-edge fields are constantly learning and modifying their ideas and practices. If expert software systems were to function as human experts they needed to change as rapidly as their human counterparts. The computers available in the 1980s—remember that the IBM PC was first introduced in 1981—simply weren't powerful enough or fast enough to run most knowledge-based systems. In addition, the effort required to update expert systems proved to be too extensive to be practical. By the mid-1990s the interest in knowledge-based systems waned.

Interest in knowledge-based systems, however, did have an important consequence. It introduced commercial software people to a wide variety of new ideas and techniques ranging from object-oriented techniques, incremental development methodologies, and graphical user interfaces to the use of rules and various logic-based approaches to application design. These techniques flourished even while basic AI techniques receded into the background.

In the past few years AI has experienced another round of commercial interest, led by major successes in game-playing applications developed by AI groups that been experimenting with the latest AI techniques.

IBM's Watson Plays Jeopardy!

In the 1990s IBM created *Deep Blue*, an AI application specifically designed to play chess. It was the latest in a series of chess-playing programs that IBM developed, and in 1997, during its second challenge match with Garry Kasparov, the world chess grandmaster, Deep Blue won the match. (Deep Blue won two games, Kasparov won one, and three games were drawn.) Those who studied the software architecture of Deep Blue know that it depended on brute force, a term computer people use to refer to the fact that the system relied on its ability to search millions of examples and evaluate millions of possibilities in a few minutes more than on its ability to reason. Specifically, Deep Blue used an approach that looked forward several moves for each reasonable "next move" and then chose the move that would yield the highest number of points. The fact that Deep Blue defeated a human grandmaster was impressive, but it didn't immediately suggest any other applications, since the application was highly specialized to evaluate a chess board and select the next best chess move.

As the new millennium began IBM was looking around for another challenging problem, and wanted to find one with more applications than chess. IBM also wanted to explore new techniques being developed in AI labs. In 2004 IBM began to consider developing an application that could play *Jeopardy!*. *Jeopardy!* is a very popular TV game that draws large viewing audiences and offers some real challenges for a computer. In *Jeopardy!* contestants are given "answers" and asked to come up with the "question" that would lead to such an answer. The "questions" and "answers" used on *Jeopardy!* are drawn from a broad base of general knowledge on topics such as history, literature, science, politics, geography, film, art, music, and pop culture. Moreover, the game format requires that the contestants be able to consider the "answers" provided, which are often subtle, ironic, or contain riddles, and generate responses within about 3 seconds.

In essence, a *Jeopardy!*-playing application posed two different problems: understanding natural language so as to be able to identify the right question and then searching a huge database of general information for an answer that fits the question. Searching a huge database quickly was a more or less physical problem, but "hearing" and then "understanding" spoken English, and finally determining which of several possible answers was the right match for the question being asked, were serious cognitive problems.

In 2007 IBM established a team of 15 people, and gave them 5 years to solve it. The team in turn recruited a large staff of consultants from leading AI labs in universities and began. The first version was ready in 2008 and in February of 2010 the software application Watson proved it could beat two of the best known former *Jeopardy!* winners, Brad Rutter and Ken Jennings, in a widely watched TV match.

The key to Watson's analytic functionality is DeepQA (Deep Question Analytics), a massively parallel probabilistic architecture that uses and combines more than 100 different techniques—a mixture of knowledge and neural net techniques—to analyze natural language, identify sources, find and generate hypotheses, and then evaluate evidence and merge and rank hypotheses. In essence, DeepQA can perform thousands of simultaneous tasks in seconds to provide answers to questions. Given a specific query, Watson might decompose it and seek answers by activating hundreds or thousands of threads running in parallel.

Watson maintained all its data in memory to help provide the speed it needed for *Jeopardy!* It had 16 terabytes of RAM. It used 90 clustered IBM Power 750 servers with 32 cores running at 3.55 GHz. The entire system runs on Linux and operates at over 80 teraflops (i.e., 80 trillion operations per second).

To sum up: IBM demonstrated that AI-based natural language analysis and generation had reached the point where a system like Watson could understand open-ended questions and respond in real time. Watson examined *Jeopardy!* "answers," defined what information was needed, accessed vast databases to find the needed information, and then generated an English response in under 3 seconds. It did it faster and better than two former human *Jeopardy!* winners and easily won the match.

Unlike Deep Blue, which was more or less abandoned once it had shown it could win chess matches, Watson is a more generic type of application. It includes elements that allow it to listen to and respond in English. Moreover, it is capable of examining a huge database to come up with responses to questions. Today, the latest version of Watson functions as a general purpose AI tool (some would prefer to call it an AI platform) and is being used by hundreds of developers to create new AI applications.

Fukoku Mutual Life Insurance Company in Tokyo (Japan), for example, worked with IBM's Watson to develop an application to calculate payments for medical treatments. The system considers hospital stays, medical histories, and surgical procedures. If necessary the application has the ability to "read" unstructured text notes, and "scan" medical certificates and other photographic or visual documents to gather needed data. Development of the application cost 200 million yen. It is estimated that it will cost about 15 million yen a year to maintain. It will displace approximately 34 employees, saving the company about 140 million yen each year, and thus it will pay for itself in 2 years. The new business process using the Watson application will drastically reduce the time required to generate payments, and the company estimates that the new approach will increase its productivity by 30%.

Google's AlphaGo

While IBM was working on its *Jeopardy!*-playing application, Google acquired its own AI group and that group decided to illustrate the power of recent AI developments with its own game-playing system. Go is an ancient board game that is played on a 19×19 matrix. The players alternate placing black or white "stones" on the points created by the intersecting lines. The goal of the game is to end up controlling the most space on the board. Play is defined by a very precise set of rules.

When IBM's Deep Blue beat chess grandmaster Garry Kasporov, in 1997, AI experts immediately began to think about how they could build a computer that could play and defeat a human Go player, since Go was the only game of strategy that everyone acknowledged was more difficult than chess. This can be exemplified by noting that the first move of a chess game offers 20 possibilities, whereas the first move in a Go game offers the first player a chance of placing the stone in any one of 361 intersections (Figure 17.1). The second player then responds by placing a stone in any one of the 360 remaining positions. A typical chess game lasts around 80 moves,

FIGURE 17.1

Two people playing Go.

while Go games can last for 150 turns. Both games have explicit moves and rules that theoretically would allow an analyst to create a branching diagram to explore all logical possibilities. In both cases, however, the combinations are so vast that logical analysis is impossible. Possible game states in either game are greater than the number of atoms in the universe. (The search space for chess is generally said to be 10^{47}, whereas the search space for Go is generally held to be 10^{170}.)

In October 2015 AlphaGo, a program developed by DeepMind (a subsidiary of Google), defeated Fan Hui, the European Go champion, five times in a five-game Go tournament. In March 2016 an improved version of AlphaGo played a tournament with the leading Go master in the world, Lee Sedol, in Seoul. AlphaGo won four games in a five-game tournament.

So, how does AlphaGo work? The first thing to say is that the core of AlphaGo was not developed as a software package to play Go. The basic neural net architecture used in AlphaGo was initially developed to play Atari software games. The Atari-playing program was designed to "look" at computer screens (matrices of pixels) and respond to them. When DeepMind subsequently decided to tackle the Go-playing problem, it simply re-purposed the Atari software package. The input that AlphaGo uses is a detailed 19×19 matrix of a Go board with all the stones that have been placed on it. The key point, however, is that the underlying AlphaGo platform is based on a generic software package designed to learn to play games; it's not a specially developed Go-playing program.

AlphaGo largely depends on two deep neural nets. A neural network is an AI approach that depends on using various algorithms to analyze statistical patterns and determine which patterns are most likely to lead to a desired result.

As already noted, the basic unit being evaluated by AlphaGo is the entire Go board. Input for the neural network was a graphic representation of the entire 19×19 Go board with all of the black and white stones in place. In effect, AlphaGo "looks" at the actual board and state of play, and then uses that complete pattern as one unit. Winning games are boards with hundreds of stones in place. The unit that preceded the winning board was a board with all the final stones, save one, and so forth. A few years ago no computer would have been able to handle the amount of data that AlphaGo was manipulating to "consider" board states. (Much of IBM's Watson's usefulness is its ability to ask questions and provide answers in human language. This natural language facility isn't really a part of the core 'thought processes' going on in Watson, but it adds a huge amount of utility to the overall application. In a similar way, the ability of AlphaGo to use images of actual Go boards with their pieces in place adds an immense amount of utility to AlphaGo when it's presented as a Go-playing application.)

Note also that AlphaGo examined 100,000s of Go games as it learned to identify likely next moves or board states that lead to a win. A few decades ago, it would have been impossible to obtain detailed examples of good Go games. The games played in major tourneys have always been recorded, but most Go games were not documented. All that changed with the invention of the Internet and the Web. Today many Go players play with Go software in the Cloud, and their moves are automatically captured. Similarly, many players exchange moves online, and many sites document games. Just as business and government organizations now have huge databases that they can mine for patterns, today's Go applications are able to draw on huge databases of Go games, and the team that developed AlphaGo was able to draw on these databases when they initially trained AlphaGo using actual examples (i.e., supervised learning).

One key to understanding AlphaGo, and other deep neural network–based applications, is to understand the role of reinforcement learning. When we developed expert systems in the late 1980s, and a system failed to make a prediction correctly according to a human expert, the developers and the human expert spent days or even weeks poring over the hundreds of rules in the systems to see where the system went wrong. Then rules were changed and tests were run to see if specific rule changes would solve the problem. Making even a small change in a large expert system was a very labor-intensive and time-consuming job. AlphaGo, once it understood what a win meant, was able to play with a copy of itself and learn from every game it won. At the speed AlphaGo works it can play a complete game with a copy of itself in a matter of a seconds.

As already mentioned, AlphaGo defeated the leading European Go master in October 2015. In March 2016 it played the world Go champion. Predictably, the world Go champion studied AlphaGo's October games to learn how AlphaGo plays. Unfortunately for him, AlphaGo had played millions of additional games—playing against a version of itself—since October, and significantly increased its ability to judge board states that lead to victory. Unlike the expert system development team that was forced to figure out how their system failed and then make a specific improvement the AlphaGo team has simply put AlphaGo in learning mode, and then set it to playing games with a version of itself. Each time AlphaGo won it adjusted the connection weights of its network to develop better approximations of the patterns that lead to victory. (Every so often the version of AlphaGo that it was playing against would be updated so it was as strong as the winning version of AlphaGo. That would make subsequent games more challenging for AlphaGo and make the progress even more rapid.) AlphaGo is capable of playing a million Go games a day with itself when in Reinforcement Learning mode.

As impressive as AlphaGo's October victory over Fan Hui was it paled by comparison with AlphaGo's win over the Go champion Lee Sedol in March of 2016. Fan Hui, the European Go Champion, while a very good player, was only ranked a 2-dan professional (he was ranked 633rd best professional Go player in the world), while Lee was ranked a 9-dan professional and widely considered the strongest active player in the world. Experts, after examining the games that AlphaGo played against Fan Hui, were confident that Lee Sedol could easily defeat AlphaGo. (They informally ranked AlphaGo a 5-dan player.) In fact, when the match with Lee Sedol took place (4 months after the match with Fan Hui) everyone was amazed at how much better AlphaGo was. What the professional Go players failed to realize was that in the course of 4 months AlphaGo had played millions of games with itself, constantly improving its play. It was as if a human expert had managed to accumulate several additional lifetimes of experience between the October and the March matches. Lee Sedol, after he lost the second game, said that he was in shock and impressed that AlphaGo had played a near perfect game.

AlphaGo was designed to maximize the probability that it would win the game. Thus, if AlphaGo has to choose between a scenario where it will win by 20 points with an 80% probability and another where it will win by 2 points with 99% probability it will choose the second. This explains the combination of AlphaGo's very aggressive middlegame play, but its rather conservative play during the endgame. It may also explain the difficulties that Lee Sedol seemed to have when he reached the endgame and found many of the moves he wanted to make were already precluded.

To beat Lee Sedol, AlphaGo used 1920 processors and a further 280 GPUs—specialized chips capable of performing simple calculations in staggering quantities.

In spring 2017 AlphaGo was at it again, playing Chinese Grandmaster Ke Jie, and once again winning. The AlphaGo team announced following that victory that their program would "retire" and that Google would focus on working on more pressing human problems. Their work on helping clinicians diagnose patient problems faster, for example, is getting a lot of attention.

What was impressive about these last games was not the wins, but the buzz around the innovations that AlphaGo had introduced into Go play. We are all becoming accustomed to the idea that AI systems can acquire vast amounts of knowledge and use that knowledge to solve problems. Many people, however, still imagine that the computer is doing something like a rapid search of a dictionary, looking up information as it is needed. In fact, AlphaGo learned to play Go by playing human players. Then it improved its skills by playing millions of games against itself. In the process AlphaGo developed new insights into what worked and what didn't work. AlphaGo has now begun to develop approaches—sequences of moves—that it uses over and over again is similar situations. Students of Go have noticed these characteristic sequences of moves, given them names, and are now beginning to study and copy them.

One of the sequences is being referred to as the "early 3-3 invasion." (Roughly, this refers to a way to capture a corner of the board by playing on the point that is three spaces in from the two sides of the corner.) Corner play has been extensively studied by Go masters and—just as openings have been studied and catalogued in chess play—experts tend to agree on what corner play works well and what is to be avoided. Thus grandmasters were shocked when AlphaGo introduced a new approach to corner play—a slight variation on an approach that was universally thought to be ineffective—and proceeded to use it several times, proving that it was powerful and useful. Indeed, following AlphaGo's latest round of games Go masters are carefully studying a number of different, new move sequences that AlphaGo has introduced. More impressively, in games just after his loss to AlphaGo Chinese Grandmaster Ke Jie started using the early 3-3 invasion sequence in his own games.

All this may seem trivial stuff, but the bottom line is AlphaGo introduced serious innovations in its Go play. It isn't just doing what human grandmasters have been doing; it's going beyond them and introducing new ways of playing Go. In essence, AlphaGo is an innovative player! What this means for the rest of us is really important. It means that when Google develops a patient-diagnostic assistant, and after that assistant has studied the data on thousands or millions of patients it will begin to suggest insights that are beyond or better than those currently achieved by human doctors.

The deep learning neural network technology that underlies today's newest AI systems is considerably more powerful than the kinds of AI technologies we have used in the recent past. It can learn and it can generalize, try variations, and identify the variations that are even more powerful than those it was already using. These systems promise us not only automation of performance, but automation of innovation. This is both exciting and challenging. Organizations that move quickly and introduce these systems are going to be well placed to gain insights that will give them serious competitive advantages over their more staid competitors.

AI Technologies

Without being very explicit, by discussing some AI techniques we've considered two broadly different approaches. One approach uses knowledge and logic in explicit ways, which means its reasoning can be checked. The other approach uses techniques that don't depend on explicit knowledge, but rely instead on the statistical analysis of patterns. The first are usually termed knowledge-based or logic-based systems. The second set of techniques are usually referred to as machine learning or neural network systems. Both approaches are being used in today's AI applications, although neural network systems predominate. We'll consider each set of techniques in a bit more explicitly.

Knowledge-Based Approaches

Knowledge-based systems represent knowledge in explicit ways and use the knowledge so represented to reason about problems. Different knowledge-based systems use different kinds of logical inferencing techniques to manipulate the knowledge to reason and draw conclusion.

To better understand the problem it's important to have a basic idea of how a knowledge-based system was architected and created. A knowledge-based system traditionally consisted of three main elements: (1) a knowledge base, (2) an inference engine, and (3) working memory. In essence, early knowledge bases were composed of rules, each independent of all the others. Thus a single Mycin rule might be something like this:

If the site of the culture is blood, and
the morphology of the organism is rod, and
the gram stain of the organism is gramneg, and
the patient is a compromised-host,
Then there is suggestive evidence (0.6) that the identity of the organism is
Pseudomonas aeruginosa.

An inference engine is an algorithm that responds to input by examining all the rules in the knowledge base to see if it could arrive at any conclusions. In essence, the inference engine relied on the principles of logic (e.g., if $A=B$, and $B=C$, then $A=C$). If it could reach any conclusions it stored them in working memory. Then the algorithm began again, treating the information in working memory as new input and checked to see if it could reach any other conclusions. At various points the application would fire rules that would ask the user questions and use the answers, which it placed in working memory, to drive still more analysis. To make things more complex the rules were associated with confidence factors (e.g., 0.6) that allowed the system to reach conclusions in which it was more or less confident. (Keep in mind that most of these rules were derived from human experts, and a lack of complete confidence is very typical of the knowledge used by many human experts.)

In the sample rule given above, if the inference engine sought to evaluate the rule it would consider one If clause at a time. It would begin by seeking to determine if the site of the culture was blood. If it could find this information in working memory it would assume it as a fact and proceed. If it didn't find this fact it might ask the physician what the site of the culture was, and so forth. Without going into more detail it's possible to see that an expert system depended on explicit statements of knowledge in the form of rules. These rules are complex and require careful testing. A large expert system might rely on a knowledge base with hundreds or even thousands of rules.

To build an expert system a developer needed to sit down with a human expert and work with the expert to elicit the rules. The expert and the developer would consider cases, examine scenarios, and systematically develop rules that an expert might use to analyze a case and prescribe one or more responses. Together they would estimate the confidence that each rule should express, and then they would test the resulting rule base against dozens of cases to refine it. The development of a knowledge base for a significant expert system was a very time-consuming and expensive process—just the opportunity costs of having a world-class human expert focus on the development of software, rather than on using his or her expertise to focus on problems the company actually faced, cost a great deal. The development of an expert system could take months or even years.

Unfortunately, once built, tested, and found to work, most expert systems began to degrade as knowledge of the particular domain continued to evolve and the knowledge base of rules became dated. Human experts are constantly attending conferences, discussing new cases and new technologies, and reading books and journals to stay up to date, while the new expert system was forced to wait until new rules could be added before it could use the latest knowledge. By the late 1980s most companies began to abandon the quest for expert systems as they found that maintaining the systems they had built was proving too expensive to justify the effort. Even more to the point, there weren't that many human experts waiting to be turned into expert systems.

In essence, the rule-based systems developed in the 1980s were too fragile, limited, and too slow. The existing technology could capture the expertise, but it couldn't automatically learn new things or update its knowledge. By the end of the 1980s most AI researchers in universities had stopped focusing on developing rule-based applications and had begun to explore new approaches that seemed to offer better chances for learning and more flexible ways of storing knowledge.

As an aside, when we discussed AI in the 1980s we often said that academic AI research was focused on a variety of techniques, including not only knowledge use but also natural language applications and robotics. At the time, however, there were no commercial examples of natural language or intelligent robotic applications.

As a second aside, as a consultant who specialized in teaching IT people about AI in the 1980s I can report on the profound change that the brief focus on AI in the 1980s produced. Commercial computing had begun in the 1960s when most large companies began to acquire mainframes to help with their data storage, bookkeeping, inventory, and payroll. The rapid growth of computing meant that many companies hired and trained programmers to use specific software languages (e.g., COBOL) and to develop specific types of applications (e.g., bank payroll systems). There weren't any computer science courses in most colleges in the 1960s. Many of these people thought of computing rather narrowly. For many, when they first began to learn about expert systems they learned more about the underlying theory of computer science than they had before. Many were intrigued with the idea that computer systems didn't need to follow a specific set of steps, but could use an inference engine to interrogate users and modify its activities as its working knowledge changed. Others found confidence techniques fascinating. Mycin, just like a human expert, usually didn't decide that a patient had a specific type of infection. Instead, it concluded that the patient might have any of three or four different kinds of meningitis, with different degrees of confidence. Since some infections can quickly prove fatal, Mycin often recommended more than one drug to treat three or four different possibilities. Programmers had come to think that software systems always generated a correct answer and had to adjust to the fact that computers could also provide multiple estimates or guesses. The whole approach used to develop knowledge systems ended up fascinating IT developers. Instead of laying out a path knowledge engineers acquired rules one at a time, put them in a systems knowledge base, and then tested the system to see if it could solve a problem. As they added knowledge the system became smarter. The idea of developing a system incrementally, and testing and revising it to improve the system, had a profound impact on IT development practices in the 1990s. Expert systems development was the ultimate example of Agile software development. Similarly, although more technical, the AI systems in the 1980s introduced software developers to the ideas behind object-oriented programming that led to extensive changes in how software is engineered today.

Although the interest in commercial AI faded in the late 1980s, and disappeared by the mid-1990s, the people who had done the exploration remained and went on to other jobs. (Most advanced computer games and a lot of sophisticated Internet and web techniques are applications of AI techniques.) The specific technologies that had been explored and commercialized in the course of that decade also remained. The companies that had developed software tools for expert systems development, for example, looked for other tasks they could assist with. Many of the expert systems–building tools were repurposed to assist business people who were focused on capturing business rules. Instead of trying to capture the rules used by human experts, rule-based tool vendors sought to position their tools to capture modest sets of rules that were used to describe business policies. These applications proved valuable in efforts to help organizations comply with laws and policy requirements of various kinds.

Other commercial developers saw an opportunity to help their organizations by providing tools to help extract patterns and advice from the large databases that organizations began to struggle with in the late 1990s. AI commercial activity in the 1980s provided most IT people with their first taste of AI techniques, and provided a clear understanding of some of the practical problems that AI systems would have to overcome if they were to prove commercially viable.

Neural Networks

In the early 1980s, when expert systems were all the rage, most of the attention in the AI world was focused on knowledge-based systems. There had been an early period of interest in neural network systems, but funding for the neural network approach had largely dried up when networks had failed to achieve results in tests of natural language processing. In the 1990s, with more powerful computers available, neural networks because the focus on most AI research.

Connectionist machines, *adaptive systems*, *self-organizing systems*, *artificial neural systems*, and *statistically based mapping systems* are all terms occasionally used to describe what we will refer to here as *neural networks*. Neural networks are said to be based on biological neural networks, but in fact they only resemble a biological network in a rather limited way.

Neural networks are systems of nodes, “neurons,” or processing elements that are arranged in multiple layers. The nodes are connected by links that at any given moment either pass information or don’t pass information from one node to the next. As information is passed certain connections become stronger. As specific outcomes or results are reinforced, pathways become stronger and the network comes to identify specific pathways with particular outcomes. This process is termed *training*. As the network is exposed to more data and reinforced it continues to modify its outcomes and is said to *learn*.

Figure 17.2 shows three process elements stacked to form a parallel structure or layer. Note that inputs may be distributed among processing elements and that each processing element produces at least one output.

Figure 17.3 pictures a multilayer network composed of 14 processing elements arranged in an input layer, two hidden layers, and an output layer. Inputs are shown feeding into processing elements in the first layer, each of which is connected to processing elements in the next layer. The final layer is called the output layer. Hidden layers are so termed because their outputs are internal to the network. This simple network has weighted connections going from input-processing elements in the first

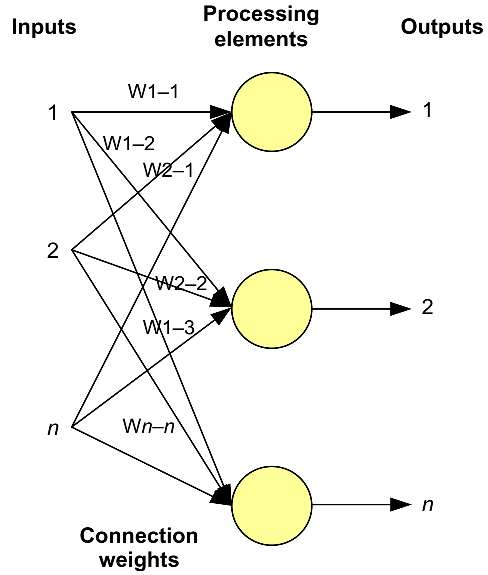


FIGURE 17.2

Multiple processing elements forming a single layer.

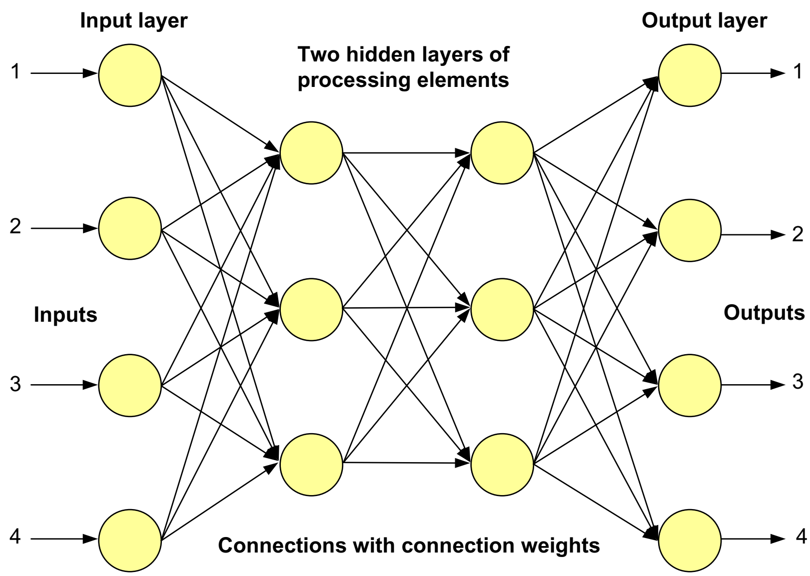


FIGURE 17.3

Multilayer neural network consisting of many interconnected processing elements.

hidden layer to processing elements in the second hidden layer, which in turn has weighted connections leading to the output layer. In other words, each output from a processing element in one layer becomes the input for processing elements in a subsequent layer, and so on. Theoretically, any number of processing elements may be arranged into any number of layers. The limitation is simply the actual computing power available and the functionality of the net.

We've already gone into more detail than any business manager will need to know. One way to think of neural networks is as a collection of algorithms, each particularly suited (but not restricted) to a different application domain. In neural network terminology the terms *algorithm* and *network* are often used interchangeably. The term *network* can be used in a generic way (i.e., not referring to any specific type of network) or it can be used to refer to a specific algorithm (or learning rule), such as a back propagation network.

Any book on neural networks at this point would begin considering various types of neural network algorithms and what each was best suited to analyze. For our purposes, suffice it to say that there are a lot of algorithms, that they involve very technical considerations, and that knowledge of these algorithms is growing very rapidly. Most business managers will never need to understand the specific algorithms, but most large companies will want an IT employee, or a consultant, who does understand them and can help figure out which ones are appropriate to the problems your company faces.

Neural networks are said to be intelligent because of their ability to "learn" in response to input data and to adjust the connection weights of multiple nodes throughout the network.

Combined Approaches

Today there is a growing emphasis on combining the two approaches. Neural networks provide an excellent way to develop a powerful system. Moreover, the system can learn and become more powerful. Unfortunately, if someone asks how the system is making a decision the developer can only fall back on an algorithm and statistical data, which isn't very satisfactory. Rule- or knowledge-based systems are hard to develop and maintain, but they offer explicit statements of the knowledge used and the logical path followed. Increasingly, the trick is to do all of visual, auditory, and nonlogical processing with neural networks, and to supplement those systems with small knowledge-based systems that can provide explicit explanations for just those tasks or subtasks where humans are likely to want an explanation.

Let's consider developing AI systems to manage a self-driving auto. You can use explicit algorithms to compare the auto's GPS location and the coordinates of the destination. Then you use a mapping systems to plot a course. You use neural network–based visual systems to actually "look" at the environment as the car proceeds along its route. You will also need a system that combines rules and neural networks if you are going to include a natural language system to talk with the rider. And you will probably use a rule-based system to apply legal rules to assure that the car stops at stop signs and follows other rules of the road. Increasingly, AI development involves knowing when to combine various AI techniques.

Developing and Deploying AI-Based Processes

A more technical book on AI at this point might turn to a discussion of how one creates a neural network or something that incorporates multiple neural networks systems, like a natural language-translating system. This book, however, is not for software developers but for business process analysts. Our focus is on how to improve business processes and not on the details of how to implement software systems to support process improvement. Figure 17.4 provides an overview of our generic process methodology with spaces for strategic and architectural changes, the set of activities involved in business process redesign, and an overview of an IT methodology for neural network development. Our focus in on how AI considerations will change activities at the process level. We assume that, once a process team has designed a new process that calls for an AI application, requirements will be provided to an IT group that will then undertake the actual creation, training, and subsequently the support of a neural network as it is used in the *redesign business* process.

So what sort of things will a process analyst have to do to take AI into consideration as he or she undertakes a new business process analysis? At the *understand* phase of a process project, practitioners will want to consider AI options as they

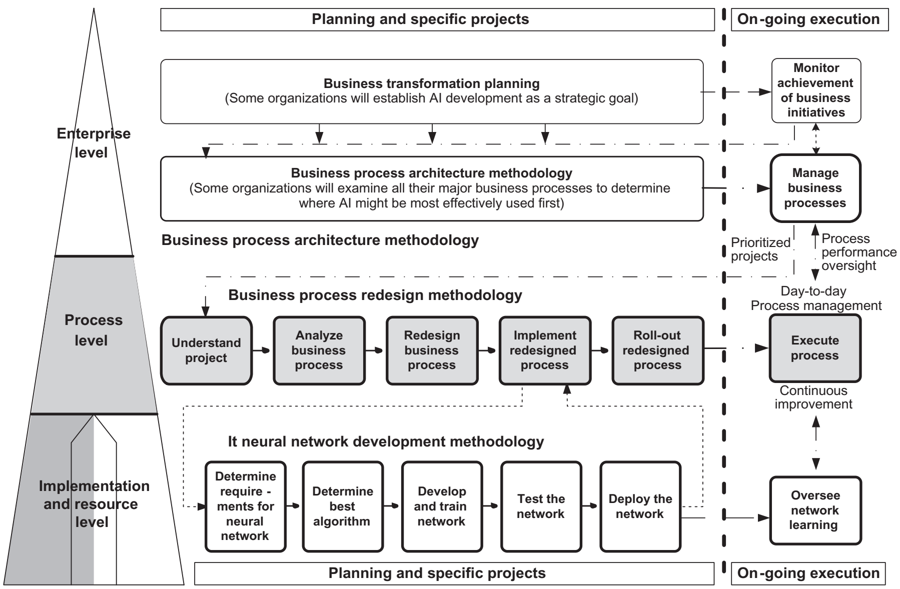


FIGURE 17.4

Redesign to incorporate AI into an existing process.

undertake a scope analysis. They will want to consider if AI techniques can be used, if their use will likely solve the problems they face, and whether an AI solution can be used as part of a cost-effective solution.

During the next few years, as organizations continue to learn about the practical uses of AI and to develop realistic estimates of the problems and costs of employing AI techniques, estimates will necessarily be less accurate, but this should change over the course of the decade as experimentation is undertaken and more is learned. In the meantime large organizations will probably want to develop teams of IT experts who follow the AI market and who can serve as members of process redesign teams to provide advice and estimates as needed.

When a process team first undertakes a scope analysis they focus on problems with the existing process. Having identified the problems associated with a given process and come to some agreement as to the urgency associated with specific problems the analyst next considers options. Appendix 1 provides a checklist of some of the problems that are common to business processes. The challenge, of course, is to imagine a solution for a problem that will be effective and can be implemented at a reasonable cost. The challenge facing process analysts as they seek to integrate AI techniques into their processes is to imagine where AI techniques can be effectively used in solving problems. Figure 17.5 provides a high-level overview of one way of thinking about the AI techniques currently available. Obviously, the techniques can be combined in various combinations. Keeping up to speed by reading magazines

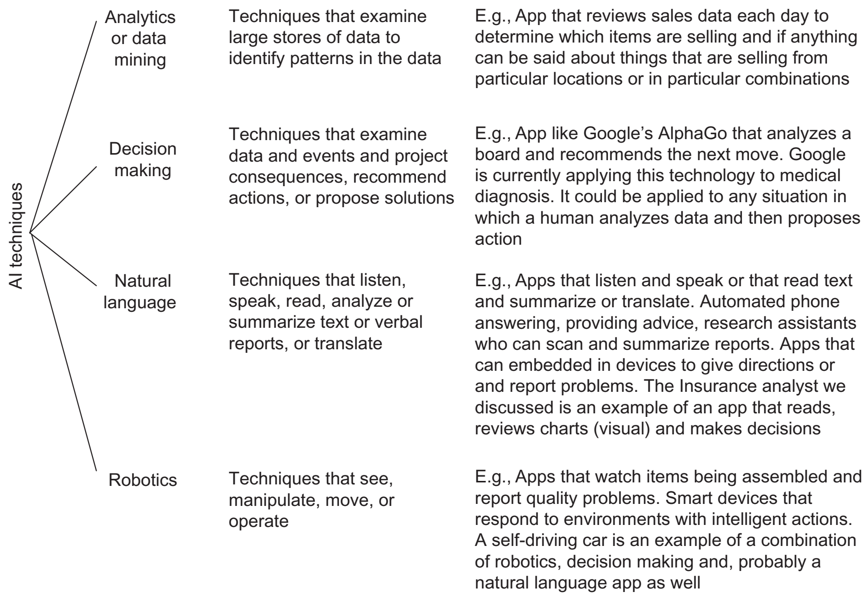


FIGURE 17.5

Some of the leading AI techniques in use today. (Most involve the use of one or more neural nets.)

such as *BusinessWeek* or *Fortune* in the next few years will provide lots of concrete examples of how AI techniques are used. At the same time lots of new companies will be formed to promote specific types of solutions for either generic problems (e.g., phone answering) or for specific industries.

It's always tempting, of course, when you hear about a specific technological solution to think about how you might field a similar solution. In the long run, however, it's better not to be led by specific technological solutions as such, but by the business problems you face, and to treat the technological examples you learn about as a stepping stone to conceiving new solutions to the specific problems you face.

It's worth taking a moment to consider whether you should aim to replace people or support them. A typical manager does a lot of different jobs, switching over the course of a day from analysis to reporting to disciplining to promoting. One could look at what the manager does and think that an AI application could do everything the manager does. A more detailed analysis would probably suggest that it would cost a great deal and take a long time to create a set of applications that would do everything that the manager does. It's usually better to dig a little deeper and identify the specific tasks that the manager does and then target one or a few specific tasks. For example, a manager may spend part of each day reading reports to stay current on new developments. An AI system could probably scan more reports in a fraction of the time and provide the manager with a summary. Or, a manager might make decisions after reviewing lots of data. An AI application could probably review the data and indicate the optimal solution, leaving the manager to actually implement the solution. We are not suggesting that organizations always avoid trying to replace managers, but rather that they do it incrementally. In most cases organizations will want to use AI applications to supplement the work being done by decision makers and then gradually expand the applications.

Considering jobs more generically, it's useful to think of all human jobs as composed of three types of skills: (1) physical or motor skills, (2) cognitive or knowledge skills, and (3) affective or interpersonal skills. To date, computer systems have proven best at duplicating physical or motor skills. AI systems will extend the reach of computers to many cognitive or knowledge skills. They may or may not ever be very good at affective or interpersonal skills.

Figure 17.6 pictures a scope diagram showing the various types of interactions that processes are typically engaged in and suggesting some areas where one might look for opportunities to use AI to support or supplement existing approaches that are generating problems.

To provide an example, let's consider that customers complain about the problems they have making phone reservations. Let's assume Cars-R-Us currently uses humans from a foreign country. Sometimes their accents get in the way of clear, easy communications. Customers have trouble understanding the phone personnel and, as a result, don't always get the precise reservations they wish. As an additional problem the company sometimes has to increase the number of answering phones to deal with high volume and sometimes has too many people waiting for calls.

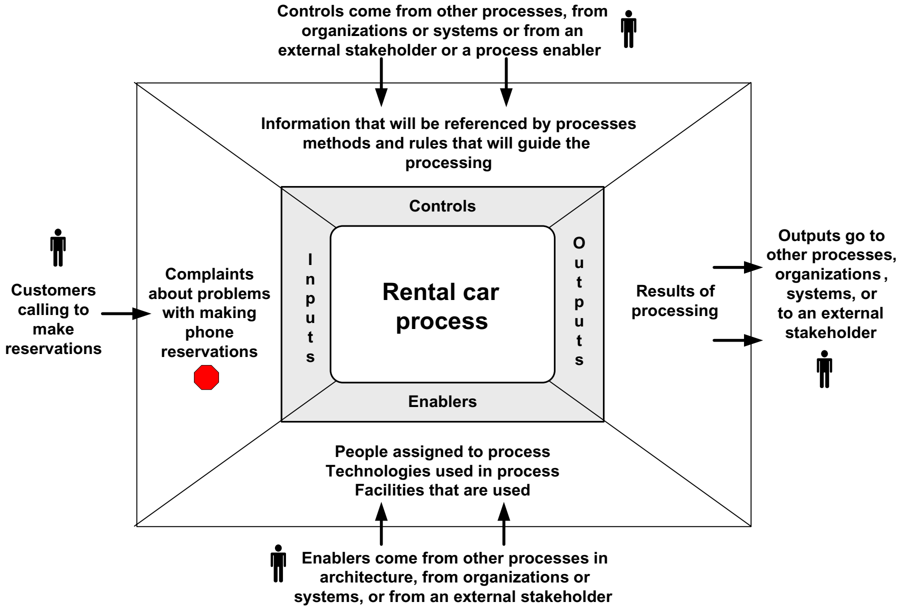


FIGURE 17.6

Scope diagram with some notes on where AI techniques might be useful if there are problems.

The process team decides this is an opportunity to try a natural language system. It can provide a higher quality voice that will use very clear English. It will also cross-check reservations as they are made to assure that all details are covered. In addition, more "agents" can be brought online as needed. This approach has already been tried by other companies and seems to work well. In addition, Cars-R-Us has thousands of calls recorded and so has the data needed to train a "car reservation agent" application.

The issues encountered in a scope diagram that AI might address include data problems, analysis failures, detail failures, bottlenecks where failure is a result of not enough people, or a need to rapidly increase or decrease the people available for the task.

The Analysis and Redesign Phases of a Project

As process analysts move from the *understanding* phase of a redesign effort and begin to carry out in-depth analysis, AI will generally function like any other technology that you use to automate a process. Specific business activities will usually remain, but will switch from being done by humans to being done by AI systems. In the example pictured in Figure 17.7, which we assume was prepared during the *redesign* phase, we assume that problems with the *reserve car* activity will be solved by replacing

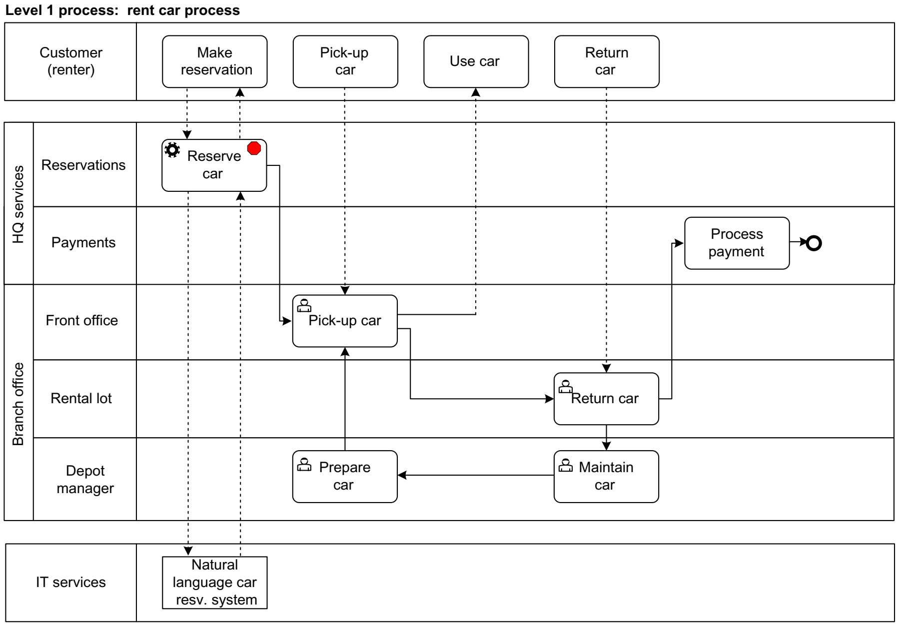


FIGURE 17.7

Redesign process that now incorporates an AI application.

the existing phone-answering operation with a neural network application that will answer phones, talk to customers as they seek to establish reservations, agree to reservations, and record this information. Normally, we don't show IT applications supporting core processes when we prepare diagrams like this, but we do in this case to focus attention on the fact that one of the subprocesses is an AI application.

If we continued to play out this example the process redesign team, probably made up of business managers and employees, business analysts, and perhaps an IT and AI specialist would develop software requirements for the AI *reservation* system to be developed and then pass those requirements on to an appropriate IT group during the *implementation* phase of the overall effort. The IT group would use a neural network development methodology to develop the actual software application required and then work with the process team to test and ultimately implement the new neural network application. The process group and the IT group would also need to establish plans with the day-to-day process management team to monitor and oversee changes in the neural network application. One would assume that, no matter how much advanced training the application received, once it started talking with customers online, began booking reservations, and so forth the system would modify its behavior and might even develop new approaches to some specific types of situations. The managers of the process and IT would want to be prepared to support the system to assure that everything ran smoothly and that useful innovations were captured and used elsewhere if appropriate.

A Quick Review

Earlier we suggested that commercial attention focused on rule-based AI technologies in the 1980s was stimulated in part by the success of two expert systems, Dendral and Mycin. It's probably fair to say that the current round of commercial interest in AI is being driven by the popular successes of two cognitive game-playing applications: IBM's Watson, which won *Jeopardy!*, and Google's AlphaGo, which defeated the world's leading professional Go player.

These victories in themselves aren't of too much value, but the capabilities demonstrated in the course of these two victories are hugely impressive. In the case of Watson it's now clear that applications can be provided with natural language interfaces that can query and respond to users in more or less open-ended conversations. At the same time Watson is capable of examining huge databases and organizing the knowledge there to answer complex, open-ended questions. In the case of AlphaGo it's equally clear that an application capable of expert performance can continue to learn by examining huge online databases of journals and news stories, or by working against itself to perform a task faster, better, or cheaper, and can improve very rapidly.

We've looked at recent advances in several ways. We've contrasted them with the rule-based approaches used in the 1980s. We've briefly considered the role of large databases and machine learning, and how pattern-matching algorithms have advanced the state of the art. We've also considered the basics of neural networks and recent advances in deep neural networks and reinforcement learning that have made today's neural networks much more powerful than earlier versions. We specifically considered two demonstration applications: IBM's Watson, which won at *Jeopardy!*, and Google's AlphaGo, a cognitive system that just beat the world champion Go player. Each of these topics has emphasized some basic themes.

There have been no major technological breakthroughs. All the basic technologies being used have been around for at least two decades. There have, however, been minor technological breakthroughs, and these in turn have forced researchers to review older techniques and reevaluate their power. Thus deep neural networks, various types of feedback techniques, and reinforcement learning have been combined with techniques for searching massive databases and the steady growth of computing power to generate a powerful new generation of AI applications.

New applications are being designed around architectures that combine lots of different techniques (sometimes the same technique used in multiple different ways) running on multiple machines, which results in lots of different problem-solving approaches leading to exciting new solutions.

AI does not describe a specific technology or even a well-defined approach to computing. The term is not being used in the rather focused way that *expert systems* was used in the 1980s. Instead, the term is being used to describe a broad approach to application development that combines a wide variety of different techniques. The applications being developed combine AI and non-AI techniques in complex architectures that include not only knowledge capture and knowledge analysis capabilities, but natural language, visual front ends, and large-scale database search capabilities.

One feature of AI applications that is very significant is the proved ability of some applications to rapidly learn and improve on their own in at least some circumstances. It was the heavy cost of development and the rigidity and the rapid obsolescence of completed expert systems that doomed the second round of AI commercialization. AlphaGo suggests that the third round of AI may enjoy a lot more success. One imagines future AI applications linked to the Internet and constantly reading journals, newsfeeds, and conference proceedings and then updating their knowledge and simultaneously improving their problem-solving capabilities.

Although we haven't gone into much technical detail it's clear that most of the developers working at commercial organizations today will have to work very hard to ascend the steep learning curve that the use of the latest cognitive computing applications will require. The development of cognitive applications relies on integrating a variety of complex algorithms embedded in a variety of different neural networks and using rather esoteric techniques to train and improve the resulting applications. No one who has ever begun to explore the technologies and the knowledge bases that are required for the creation of a powerful natural language program will imagine that most companies could successfully hire people to develop a proprietary natural language application. Similarly, the effort required to build a powerful learning application, like AlphaGo, requires a very thorough knowledge of a vast number of new and complex learning algorithms that only a few corporate software developers currently know. This means that the growth and utilization of new, cognitive computing techniques and tools will depend on commercial organizations obtaining packaged modules to provide these capabilities, and then tailoring them for specific needs.

What is important for the readers of this book to know is that AI techniques will increasingly dominate software development and that computer systems will increasingly prove capable of duplicating what were previously thought to be human tasks. This in turn will require business process developers to reconsider what processes can be automated and to become more skilled in their analysis of tasks that humans currently perform. The techniques described in this book should enable process analysts to conceptualize the overall challenges implicit in AI-based business processes. At the same time, predictably, new process analysis techniques will be developed and will need to be mastered by developers who will increasingly have to analyze cognitive and decision management tasks of all kinds.

Notes and References

Some commentators seem to think that the emphasis on "artificial" suggests that AI is not real intelligence, but fake intelligence, much as artificial flowers are only plastic replicas of real flowers. In fact, the committee originally intended the term *AI* to apply to intelligence shown by *artifacts*—intelligence shown by things made by humans. Hence, AI is best understood as a synonym of *machine intelligence*.

For a good overview of the interest in AI in the 1980s: Harmon, Paul, and David King, *Expert Systems: Artificial Intelligence in Business*, Wiley, 1985.

A nice discussion of the breakthroughs of Hinton, Yoshua, and others is available at http://www.iro.umontreal.ca/~pift6266/H10/notes/deepintro.html.

See the *deep learning* entry in Wikipedia for a good review of deep learning. It is available at https://en.wikipedia.org/wiki/Deep-learning.

Hsu, Feng-hsiung, *Behind Deep Blue*, Princeton University Press, 2002.

Hall, Curt, "How Smart Is Watson, and What Is Its Signifiance to BI and DSS?" Advisor, *Cutter Consortium*, March 1, 2011.

Ferruci, David, et al., "Building Watson: An Overview of the DeepQA Project," *AI Magazine*, Fall, 2010.

A *perfect information* game refers to a game that has well-defined rules and in which all the elements and moves are known to all players at all times. In theory it is always possible to analyze such games to determine if there is a set of moves that will guarantee a win. This can't be done, however, if the number of possible moves is so great that it exceeds the ability of our fastest computers to physically do the analysis. Both chess and Go fall in this latter category, and are termed *NP complete games* (nondeterministic polynomial time)—games that are impossible to analyze completely because the combinations are so extensive as to make complete enumeration impossible.

Silver, David et al., "Mastering the game of Go with deep neural networks and tree search," *Nature*, Vol. 529, Issue 7587, pp. 484–489, January 27, 2016.

Mnih, Volodymyr et al., "Playing Atari with Deep Reinforcement Learning," *Proceedings of the 13th International Conference on Artificial Intelligence and Statistics* (AISTATS, 2010).

A detailed description of the Go innovations that AlphaGo has introduced is available at http://deepmind.com/blog/innovations-alphago/.

CHAPTER

The future of business process management 18

This book was written to provide today's business managers and process practitioners with an overview of the concepts and best practices available to them. We have tried to cover the wide variety and the complexity of today's business process work. In the last chapter I suggested one direction that I think process work will take in the near future. It will incorporate AI and use it to automate business processes far beyond what we have achieved to date. In this chapter I want to extend my overview of future developments in process work and then reiterate the major themes of this book.

I opened the book by saying: *We live in a world that changes faster all the time.* In 1968, when I first became involved in business process improvement, computers were nowhere to be seen. They existed and were being used in many businesses, but they were being used in air-conditioned rooms well hidden from most employees. When people came to the company I worked for and asked us to help them improve their processes they invariably referred to problems that involved employees. Since then much has changed. In the 1970s computers became much more common. In the 1980s personal computers were introduced. In the 1990s the Internet became popular and the Web became a part of our culture. Computers began to switch from being business machines to being at the heart of our communications network. Hammer and Champy wrote their well-received book, *Reengineering the Corporation*, and argued that up until then companies had only really used computers to solve specific problems—automation had been used to pave existing cow paths. In the 1990s they argued it was time to rip out whole areas of the business, rethink how work could be done when computers were used effectively, and create new business processes that would function as superhighways. From the 1990s on computer automation in one form or another has been relentless. Some would cite failures resulting from reengineering. Some companies tried to move too fast and attempt things for which the technology was insufficiently mature. There is always a lag between when a new idea gets a lot of attention and when companies figure out how to effectively implement the new idea.

In spite of problems and occasional backsliding the reengineering idea took hold. Computers moved from a support function to become the essence of every organization's strategy.

Today one popular cry is for *digital transformation*. In a sense it's just another term for business process change or for reengineering, but let's ignore the jargon and focus on what underlies it.

Business Process Change. https://doi.org/10.1016/B978-0-12-815847-0.00018-2

Amazon.com was formed in 1994 by Jeff Bezos in Seattle (Washington). He has described in several interviews how he sat down with some friends, speculated on how things were going to be sold over the newly popular Web, and wondered what product would be good to sell online. After considering several possibilities, each with their advantages and disadvantages, he settled on selling books. In essence, Amazon created a website where users could come, browse through all the available books, choose one or more, and have it sent to their home. Customers set up a credit card account with Amazon and any books they bought were charged to their cards. Because there were no tax requirements for online sales in 1994 Amazon customers got the book at a discount, which Amazon provided, and without tax constituting a saving even after they paid a shipping fee. Over the course of time Amazon moved from ordering books from a publisher after the customer ordered them to setting up warehouses to stock all popular books. In addition, using their rapidly expanding database, once a customer chose a book Amazon provided the customers with information about other books that customers who bought that book had also purchased. They also offered to send customers emails when a favorite author published a new book. Amazon became a rapid sensation and the poster child for web business.

Amazon didn't have local stores, or the expense or overhead associated with local stores. They did have a warehouse, and then a few warehouses, but these were very large structures and very efficiently run. Robots were used to find and bring books to shipping clerks. Deals were cut with the US Postal Service and package delivery services to keep their delivery costs to a minimum.

I love to read mystery novels. I'm often told of series I should check out. I used to go to a local bookstore and find that the store had the fifth volume in the recommended series, the volume that had just been published. But I wanted to start the series at the beginning, with a book that had been published 5 years ago. The book store was happy to order it from the publisher, but it was an inefficient process that invariably took a month or more. Then I discovered Amazon. I went online, typed in the author's name, and got a list of all the books he or she had ever written. Some of the older books might not be in print, but Amazon had deals with used book stores, and they listed used books as well as books in print. I could easily find the first volume in the series, new or used, and order it. Later, if I liked the author, I could go back and order the next in the series or more likely the next two or three. No physical book store could compete with the service Amazon offered—no store was big enough to stock all the books published in the last several years. Amazon was. Amazon seemed to understand my needs as a reader, their interface was easy to use, they often suggested additional books that I ended up buying, and so forth. Amazon completely changed the process that I as a customer went through when I purchased a book. They made the process much easier and I in turn have been purchasing more books from them ever since.

Amazon revolutionized book buying by using the Web to create a new customer interface. They used shipping services to deliver books to my home. Moreover, they offered lots of other services that made my life as a reader more convenient. Once Amazon began several other companies tried to compete. In some cases bookstore chains offered an online service. In other cases publishers tried to use the Web to sell direct to customers. None came close to making the overall experience as convenient as Amazon. Another company with a better interface or better service might have given Amazon competition—there have been many instances in which the first company to offer a service is shoved aside by a later entry that offers a better service, but it didn't happen in Amazon's case. Within a few years Amazon completely revolutionized the publishing industry. In effect, they used a digital business model to transform an industry.

Amazon didn't rest on its laurels. It introduced a handheld computer that a user could use to read a book that they downloaded from Amazon. In essence, Amazon introduced the idea of digital books, and began to encourage authors to write books that Amazon could publish in digital form. Within a short time most publishers found that they needed to publish both paperback and digital versions of all their popular books. Initially, I didn't like reading digital books. But I travel quite a bit, and I read on the plane and in airports where I often have to wait between flights. Using my Kindle I could download a dozen books to one light handheld computer and be assured that I had enough books to last through a week of travel. Formerly, I had stuffed a half dozen books into my briefcase—now I just bring along my Kindle.

Amazon proceeded from books to almost everything else you can imagine buying in a store, including groceries. One went to the Amazon site with which one was already familiar, and where one already had an account and proceeded to enter a generic name for an item you wanted—say, picture hanging hooks. Rather than going online to find a store that sold them, Amazon presented lots of choices side by side and allowed you to choose. Your choice would invariably arrive in a few days.

Today Amazon is regarded as a generic retail platform. That means that anyone who wants to sell products in an advanced market like the United States will want to make their products available via Amazon's website because a growing number of items are being sold that way. Why would I want to go to a website run by a picture hanging hook company, figure out how to use their website, establish a credit relationship with them, and so forth, just to make a two-dollar purchase. Instead I go to Amazon, find and buy the item in minutes, and move on to other tasks. I've had problems with items I ordered from Amazon, but Amazon has always been very quick to provide solutions. Amazon hasn't just revolutionized publishing and bookselling worldwide. They are now in the process of revolutionizing retail selling. Bookstores began to disappear in the early years of this millennium. More recently, major retail stores are disappearing, and lots more will disappear in the near future. Large suburban shopping centers can no longer lease all their stores. The world of retail sales has been completely transformed.

Let's consider another example. Netflix was founded in 1997 by Reed Hastings and Marc Randolph, two guys from Silicon Valley. The company was founded to let users order DVDs online. The company would let the users choose one or more movies listed on their website, and then ship the DVD to the customer. When the customer was done he would ship back one DVD and another would be provided. This approach evolved dramatically in 2007 when the company began to provide a streaming service that made the movies available on the user's TV set. Customers could now sit in front of their TV sets and download any movie they wanted. Each customer paid a monthly fee charged in just the same way as one pays for other utilities. Note that whether Netflix sells DVDs or downloads movies to your TV they still need to pay a fee to the owner of the movie. However, since Netflix was popular and producers wanted to sell their movies they were happy to work out a deal with Netflix to offer movies at a reasonable price.

In 2012 Netflix offered its first Netflix-produced TV series and has gone on to produce a variety of series and movies. In 2018 Netflix produced 80 feature films and plans to spend over $12 billion dollars this year producing content. One-fourth of that amount would make Netflix larger than any Hollywood studio, or BBC's movie unit. Netflix is currently the largest entertainment content producer in the world. It has completely revolutionized the movie, TV, and entertainment industries.

Netflix started by focusing on how it could provide a better customer experience for those who wanted to see a movie. Its initial competition were stores that customers would visit to rent DVDs. Like booksellers, DVD stores were always limited in the movies they could stock. Using the Web, Netflix made it easy for customers to find movies they wanted and to arrange for them to be delivered to their homes. Being able to operate out of a huge centralized warehouse they could provide movies that weren't always available at stores. When they introduced streaming they went further and eliminated the need to shop on the Internet. One could look for movies and order them while sitting in front of one's TV—and then one could watch the movie. Obviously, other streaming services sought to compete—Amazon, for example, is offering its own service. To date, however, Netflix's interface has proven satisfactory and its fresh content is increasingly adding a real plus that customers apparently enjoy.

It's worth noting that Netflix is a truly worldwide service provider. Not only does it provide film content around the world, but it also has its films dubbed in a variety of languages to satisfy its worldwide audience. Netflix has effected a digital transformation of the movie and TV industries.

Most people think of Apple as a computer manufacturer. They created one of the first personal computers, the Apple, and then went on to create the first commercial computer with a graphic interface, the Macintosh. They also created one of the first handheld flatscreen computers, and later the iPad. They also created the first smartphone, the iPhone. It's easy to think of the iPhone as a phone, but it's really a lot more—it's a small handheld computer. Today the majority of the world's population access the Internet and Web by means of a smartphone. There were digital cameras before the iPhone, but Apple's phone made phone photography ubiquitous. Since the introduction of the iPhone, Kodak, the world's largest manufacturer of film and photographic papers, has gone bankrupt and the photographic industry has been utterly transformed.

Now let's briefly consider another new company, Uber Technologies, which was founded in San Francisco in 2009 by Travis Kalanick and Garrett Camp. The core of Uber's business is an application that runs on a smartphone. Using the application a customer can call for a taxi. The application uses the phone's GPS to locate the customer and it uses the GPS locations of available taxis to plot them on a map, identifies the closest available taxi, and routes it to the customer. Often the customer is already a member of Uber and thus Uber has the customer's credit card information. The application sends a photo of the taxi driver so the customer will be able to identify the driver when he or she arrives. When the cab comes the customer gets in, rides to a desired location, and gets out. The financial transaction is automatically handled via the customer's credit card.

The smartphone is the platform in this case, and Uber is the application that links customers to available cabs. The interface is very nice and easy to use. The whole process has been well thought out and is very convenient. Uber caught on quickly and now operates in some 600 cities throughout the world. Uber relied on digital technology to transform the taxi business. Their approach makes it easy for smartphone users to get cabs. They have met stiff resistance from traditional taxi companies, but seem destined to transform the taxi industry.

Uber has been investing a lot of its profits in developing self-driving cars, and eventually hopes to provide self-driving taxis to complement its smartphone application. That really will revolutionize the taxi business.

We could go on and discuss several other businesses that have transformed whole industries. In each case a few things stand out. Such companies focus on the customer's experience (what we called the customer's process in Chapter 9). In essence, the company figured out how to redesign the customer's process to make it easier and often reduced the price the customer paid. Second, the company supported the new customer experience with a website or other interface, and used computer technology to automate their back office operations. Put a bit differently, the company created a "platform" or site where the customer could go to find what he or she wanted, order a service, deal with problems, and get various kinds of information. Once the platform was established and a large online audience had accumulated the company had the ability to get the original providers to work with them at a very reasonable cost, because the company controlled access to the customers that the original providers wanted to reach. (The platform became a major marketing "channel.") In many cases the platform owner reduced costs further by cutting out various middlemen. It encouraged authors to write digital texts for them or began making its own movies. In the case of Uber it has begun to experiment by offering self-driving cars.

Although we haven't put much emphasis on it in this chapter in the last chapter we described how AI will increasingly dominate software automation in the near future. Today's AI technologies depend on access to large databases because AI applications are trained via the databases. The companies we have discussed—companies that interact with customers via a platform—are perfectly placed to gather vast amounts of data about what customers want and like. We have already mentioned trivial data-mining applications like those used by Amazon to identify other books customers might like. The same companies that are transforming their respective industries are the very companies that are investing heavily in AI and will be among the first to introduce natural language, decision support, and intelligent robotic applications in the near future.

We expect that the trends that are now apparent will dominate the next decade or two.

In essence, if a company is to survive in the years ahead its managers will need to think very seriously about the company's business model. There are many ways to approach discussions of an organization's business model. I suggest that the place to begin is to think about what value you are providing to your customers, and then move on and think about exactly what a customer has to do to receive value from your organization. Think about it from the customer's perspective: What does the customer have to do to get your product or service? Usually, a customer relies on several processes—in much the same way there are several options on well-designed websites. You might look to see what books are available. You might establish an account. You might order a book. You might decide you want to cancel a book, or return it once it's arrived. Consider each customer process in turn. Then think of what kind of platform you could develop to interface with the customer. It's easy to imagine a website or a TV screen as a platform, but increasingly platforms will be more physical. As cars become self-driving they will become offices and entertainment platforms for their riders. Airplanes are already platforms in this way, as are smart phones and ATMs. These various platforms will increasingly structure or constrain the kinds of business processes you can design. Your job will be to develop a business model that can deliver value to customers by means of the various processes customers will use to access your business.

This book was written to provide today's business managers and process practitioners an overview of the concepts and best practices available to them.

Before considering the future in any more detail, however, it might be useful to consider just what the situation is today. Business process improvement has been a perennial concern of companies ever since the Industrial Revolution began in the late 18th century. Moreover, as global markets have grown and the introduction of new technologies has accelerated, change has become the dominant feature of modern business. Competition today is fierce, and will grow more fierce in the near future as today's companies struggle to establish global companies that can compete everywhere in the world. Nonprofit organizations and government institutions face similar problems as they seek to scale up to deal with discontinuous technology changes and global complexities. Organizations that survive and prosper will be those that master the need for constant innovation and change. The question we need to consider here is how organizations can best structure themselves to change and survive.

At present no consistent pattern can be found. Some companies seem to emphasize hiring creative individuals and living with the chaos of constant, radical change. Other companies, like Toyota, emphasize a process-focused approach and develop very systematic approaches to change. As a broad generalization, organizations that depend on people and creativity, like movie production, are more adapted to informal methods, while organizations that have huge investments in machinery and relatively long production times tend to be more systematic.

Even within a given industry, however, the commitment to process work varies. More to the point there is no agreement on who is ultimately responsible for change and innovation within a modern organization. Some emphasize strategy and innovation and tend to think of business executives as the leaders in driving organizational transformation. There are certainly a number of process initiatives that are demanded and driven by CEOs or divisional managers. Others emphasize professional teams that report to executives. The teams can either consist of individuals who think of themselves as change managers, as business process professionals, as Lean or Six Sigma practitioners, or as business analysts. In some cases these individuals may be staff members who report directly to division or department heads and in other cases they may be groups in a group dedicated to supporting process change within an organization. Some organizations assign process change to IT and expect the CIO to manage process improvement. Most organizations today, however, embrace a mixed approach, with process change agents in staff positions, in Lean Six Sigma teams, and in IT groups. Indeed, surveys suggest that one of the biggest problems facing process change people within organizations is the confusion among competing approaches and the difficulty they face obtaining senior management support for a single approach to a specific problem. Any vendor who has tried to sell process improvement consulting to business organizations knows the difficulty of identifying who is responsible for process work within any given organization. In a recent presentation to analysts IBM process marketing executives said that any major sale they wanted to make typically depended on obtaining the agreement of the COO, the head of a line of business, and the CIO—and that can be hard to do.

It would be nice to think that in the near future a process profession would emerge. There are business process management (BPM) programs in many universities and they will presumably graduate individuals who have a strong commitment to the process perspective, and to helping organizations become more systematic in improving their processes. Indeed, we are confident that will happen. The question, however, is whether it will be enough. We have often spoken of the Capability Maturity Model (CMM), which suggests that organizations must go through a series of steps as they become better able to utilize process concepts and practices. In the course of our consulting we have visited organizations all over the world that are at CMM Level 2. They have process teams—be they Lean, Six Sigma, BPM, or IT teams—and they are working at improving the business processes of their organizations. In many cases they have already completed impressive process improvement projects and seem certain to do more impressive work in the near future. We often leave such an organization thinking that it will soon be a Level 3 organization, then proceed to Level 4, and so forth. Frequently, having visited such an organization we return in a few years, fully expecting to see how they have progressed. Instead, we find different people working on different process problems, and the organization is still essentially at Level 2. In essence, the older group either never got up enough momentum to become a Level 3 organization, or worse they tried and failed. Figure 18.1 shows a CMM stairstep diagram with a gap where organizations that try for Level 3 and fail end up.

In our experience the key to crossing the chasm that lies between Level 2 and Level 3 on the CMM is *sustained* senior management support. A good process team can work hard at Level 2 and turn in impressive results. Their work can convince lots

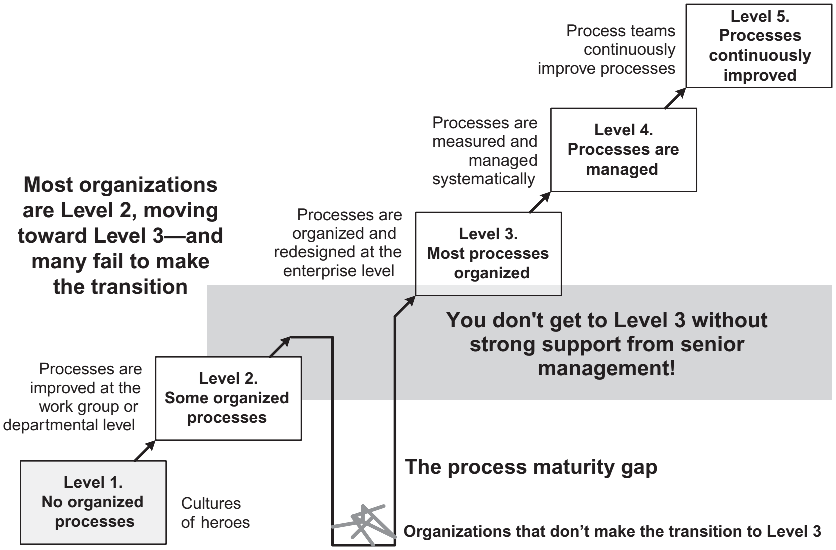


FIGURE 18.1

Process maturity gap.

of other middle managers to give the process approach a chance. But, ultimately, a shift to enterprise-wide process modeling and systematic process measurement depends on senior executives. They have to provide the budget and the backing to assure that the organization as a whole gives the process perspective a real chance. Some executives get excited about what process can do and give it their backing. One thinks of Jack Welch at General Electric or of Fujio Cho at Toyota, both of whom worked hard to commit their organizations to a process focus. Other executives simply don't get the process perspective and prefer to try and manage their organizations by relying on financial statements or by constantly rearranging the organization chart.

Most business schools that offer MBAs don't put much emphasis on processes. If anything they do the opposite, teaching silo thinking by offering completely independent courses in Marketing, Manufacturing, and Finance. In most cases an MBA picks a specialty and then goes on to work for 20 years as a finance or a marketing manager before being given a shot at a senior executive position, when he or she is suddenly expected to think holistically about the organization.

Those of us who believe in the value of the business process perspective face a twofold challenge. First, of course, we need to educate people in the concepts and practices of process improvement. If we don't have people who can consistently improve an organization's business processes, then we have no claim to anyone's attention. Beyond that, however, we have to work to sell senior executives on the value of the process perspective. We need to convince executives that they will understand their organizations better and make better decisions if they conceptualize their organizations with process concepts. Figure 18.2 repeats a diagram that we used earlier to illustrate how a process perspective ties everything together.

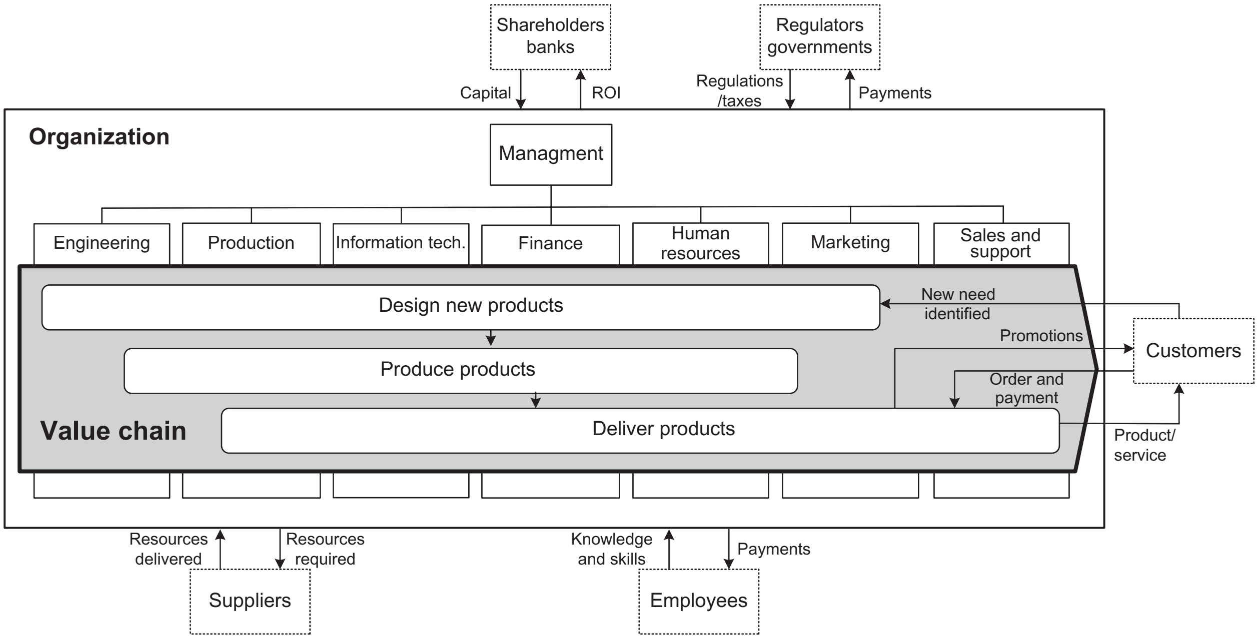


FIGURE 18.2

Overview of a company value chain.

Figure 18.2 shows the stakeholders (shareholders and customers), the departmental structure, and how all the departmental activities are tied together in cross-departmental processes that ultimately deliver value to customers and other stakeholders. In a more detailed version it would provide a diagram that one can use to track down the source of problems. If enough senior executives begin to think in terms of a process perspective an organization can begin to think about how it can change the way it works.

This book has ranged over a variety of topics, and considered issues that include both enterprise design and process improvement. Complete books have been written on several of the topics we treat in a single chapter. We have provided references to books and websites in the Notes and References that were placed at the end of each chapter to help interested readers pursue various topics in more detail. Our goal here was not to make readers into masters of tactical details, but to give them the basics they need to think strategically about how they should approach business process change in their organizations. We have posted a vocabulary of the terms used in this book on our associated website: http://www.bptrends.com. Each month we publish articles, book reviews, and reports on that website. All the material we have published over the course of the last decade is available at the website, so that visitors can search and find material that extends across all the various ideas covered in this book. The website is freely available and we urge readers to visit to extend and update the material presented in this book.

Finally, we want to end by briefly reiterating the major themes we have emphasized in this book.

First, there is the idea that *organizations are systems*. Things are related in complex ways, and we only understand organizations when we understand them as wholes. We believe that every manager should be able to draw an organization diagram of his or her organization at the drop of a hat. That would demonstrate at least high-level acquaintance with how various functions relate to each other and to suppliers and customers.

Second, we believe that *the best way to understand how things get done and how any specific activity is related to others is to think in terms of processes*. Process diagrams provide a good basis for demonstrating that one understands how things flow through an organization, from supplies and new technologies to products and services that are delivered to customers. In an ideal world we'd like every manager to be able to access a process model of the process he or she is managing by going to the company's business process website. We believe that a basic acquaintance with process-diagramming techniques is just as important for today's manager as familiarity with spreadsheets and organization charts.

In the 1990s it was sufficient to understand processes. Today leading companies are moving beyond specific processes and trying to integrate all a company's process data into enterprise tools that make it possible for senior managers to monitor and control the organization's processes. Today this is being facilitated by business process modeling tools and repositories, and by exciting new approaches like business process frameworks. By the beginning of the next decade leading companies will be using business process management software (BPMS) applications to manage large-scale business processes on a day-by-day basis. At the same time companies are focusing on realigning their key performance indicators on processes and establishing a process management system. Thus a manager today not only needs to understand specific processes, but he or she needs to understand how all the processes in the company combine into a business process architecture. Figure 18.3 reproduces BPTrends' process pyramid and highlights some of the different types of concerns and alignments that today's manager should understand.

At the same time managers need to understand how the different processes are aligned to strategy and value chains and to a variety of enterprise resources. Figure 18.4 shows how processes can be key to understanding and organizing what is done in a company. A business process architecture provides everyone with an overview of how all the activities in the organization relate to one another and contribute to satisfying customers. A well-understood process shows how each activity relates to every other and where departments must interface for the process to be effective and efficient.

The same process diagram provides the basis for defining measures and aligning those measures with organization strategies and goals, departmental goals, and process and activity measures. This in turn defines the responsibilities of individual managers and supervisors. Each manager should know exactly what processes or activities he or she must plan and organize and just which measures to check to monitor and control the assigned processes and activities.

Drilling down in the diagram we see that well-defined activities provide the framework on which a whole variety of organizational efforts can be hung. Each

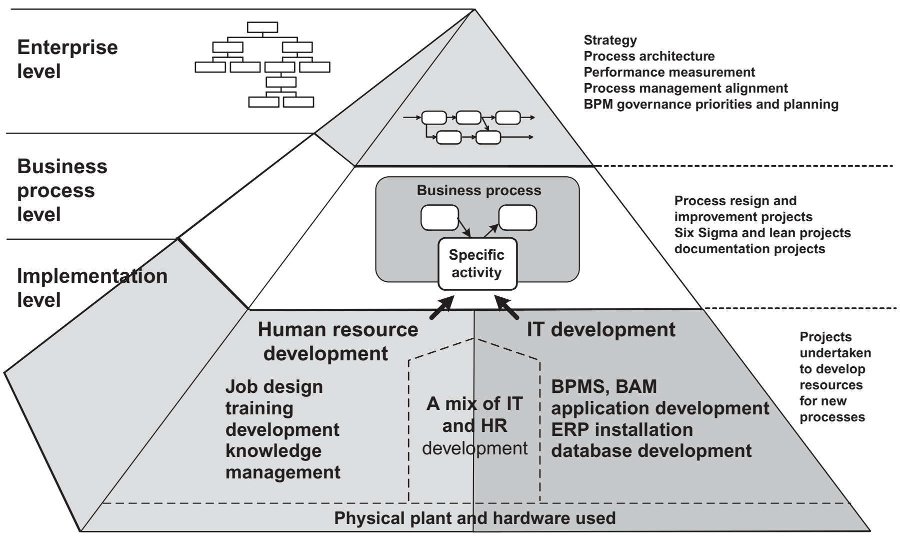


FIGURE 18.3

BPTrends' business process pyramid.

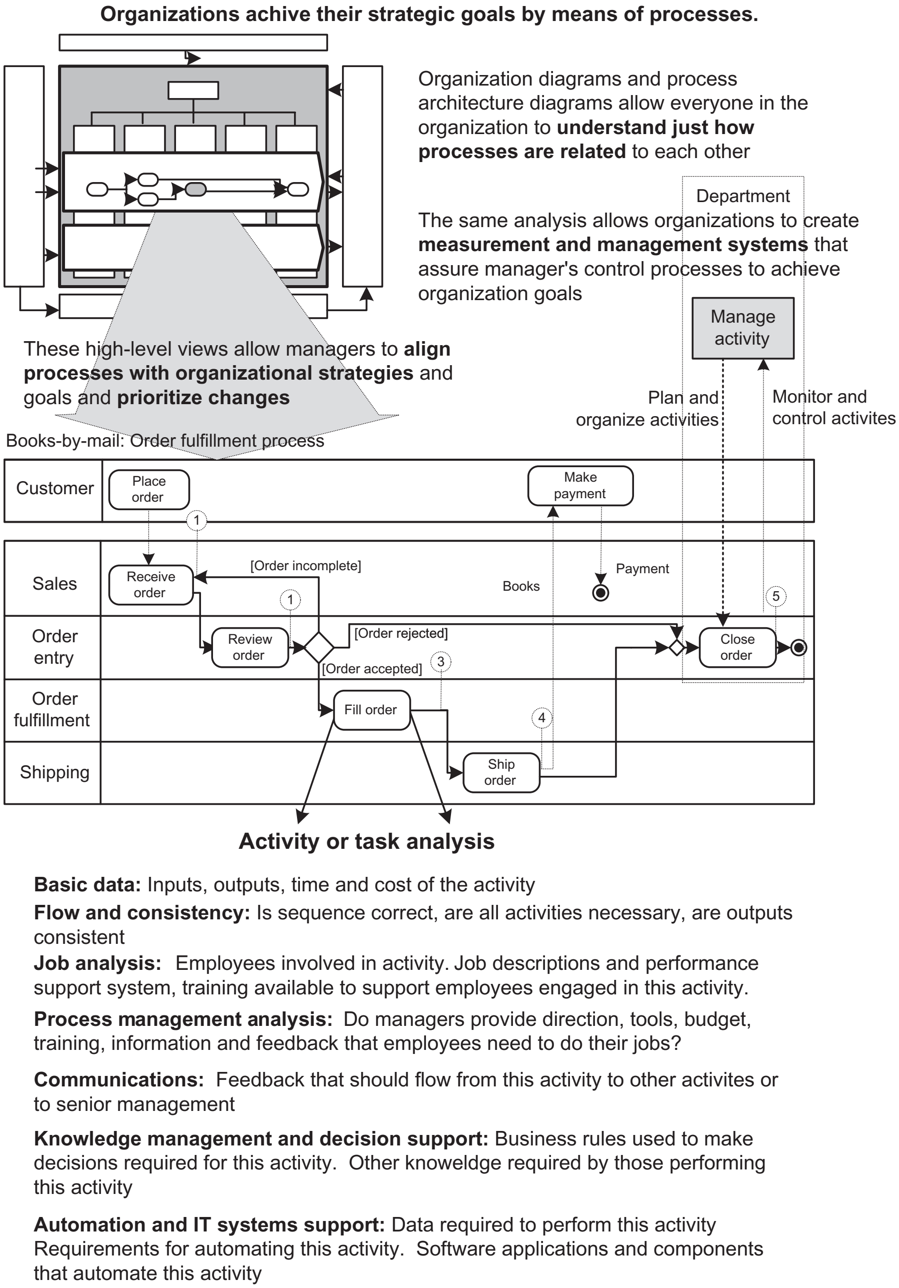


FIGURE 18.4

Process is key to understanding an organization.

activity should generate data on inputs and outputs, on time and cost. Activities are the basis for cost-based accounting systems. They are also key to analyzing jobs and developing job descriptions and training programs.

Activities also provide a framework for organizing knowledge management efforts, feedback systems, and decision support systems. And they also form the basic unit for database systems and for defining requirements if the activity is to be automated.

As enterprises become more mature in their understanding and use of processes they learn to constantly adjust their processes and to align the activities within a process in response to changes in their external environment. Each strategy change results in process changes. It also results in changes in the management and measurement systems and in all the other support systems that are tied to the processes and activities. Thus the process architecture becomes the heart of enterprise alignment and organizational adaptation.

We are constantly asked how to get started. You start from wherever you are. You need a major management commitment to do enterprise-level process work. If your management isn't ready to make such a commitment you will need to work on local processes and build up some credibility while looking for a sponsor in your senior management group. The Software Engineering Institute's maturity model provides a pretty good overview of how most companies evolve (see Figure I.5). Companies begin at Level 1 without processes. They move to Level 2 as they develop some processes—usually within departments or divisions. They move to Level 3 when they start to work on organizing all their processes together into an architecture. They move to Level 4 when they develop the process measurement and management systems necessary to truly control their processes. Increasingly, this will be the point at which leading companies will seek to install BPMS applications. Installing them if your organization is at a lower level is probably a waste of time. Finally, companies move to Level 5 and use Six Sigma or something very similar to constantly optimize their processes.

Moving up the CMM scale requires a major commitment on the part of an organization's executives. It isn't something that can be spearheaded by a departmental manager or a business process committee. It requires the active support of the CEO and the entire executive committee. Moreover, it isn't something that can be done in a single push or in the course of a quarter or even a year. BPM and improvement must become part of an organization's culture. Process improvement must become something that every manager spends time on each day. It must become one of the keys to understanding how the entire organization functions.

If business process improvement is to be ingrained in the organization, then improvement itself must become a systematic process. Every organization needs a BPM group to support senior management just as they need a finance committee to be available to provide financial information. The process architecture committee should be constantly working to align and realign corporate processes to corporate strategies and goals. As goals and strategies shift, process changes must be reprioritized and new process redesign or improvement projects must be undertaken. Just as senior executives receive daily or weekly reports on financial results they should also receive daily or weekly reports on how the various processes are achieving their assigned measures and what efforts are being undertaken to improve processes that fail to meet their goals. This kind of reporting assumes a matrix management structure, where there are managers with specific responsibilities for seeing the processes perform as wholes.

At the same time most organizations benefit from a Six Sigma program that makes all employees aware of the need for constant process improvement. A well-organized and integrated Six Sigma program is a major step toward creating a process-centric culture.

At the tactical level, process redesign and improvement have changed and will change more in the near future. In the early 1990s, when most managers first learned about process redesign, the organization and improvement of processes were regarded as tasks that should be handled by business managers. In effect, a redesign team determined what needed to be done. They only called the IT organization in when they decided they needed to automate some specific activities.

Today the use of IT and automation has progressed well beyond that early view of business process redesign. Increasingly, companies and information systems are so integrated that every process redesign is also a systems redesign. Today every IT organization is heavily involved in business process redesign. The Internet, email, and the Web have made it possible for IT organizations to achieve things today that they could only dream of in the early 1990s. Information systems are making it possible to integrate suppliers and partners—and in many cases, customers—in networks that are all made possible by software systems. AI will soon extend this and generate intelligent assistants of all kinds to assist human workers.

More important than technologies, however, is IT's new commitment to working with business managers to improve processes. In essence, the business process is becoming the new basis for communication. IT will increasingly focus on offering solutions that improve specific processes, while keeping in mind how specific processes relate to other processes. As BPMS techniques evolve, we will see IT architects and business managers working to automate major business processes as BPMS applications that will facilitate rapid change and provide real-time monitoring capabilities for senior executives. The successful development of large-scale BPMS applications will bring IT and business managers together as never before.

To commit to managing an organization in a process-oriented manner requires that you commit to an ongoing process of change and realignment, and increasingly to BPM systems. The world keeps changing, and organizations must learn to keep changing as well. We have pictured this commitment as a cycle that never ends and is embedded within the core of the organization. We term it the *enterprise alignment cycle* (see Figure 18.5).

A process organization constantly monitors its external environment for changes. Changes can be initiated by competitors, by changes in customer taste,

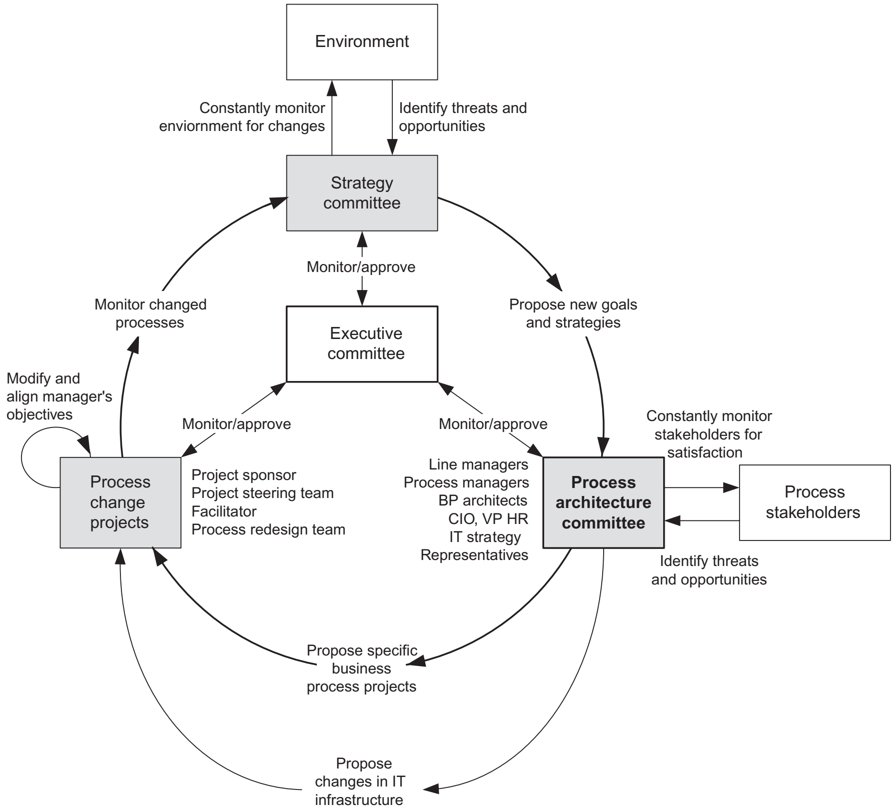


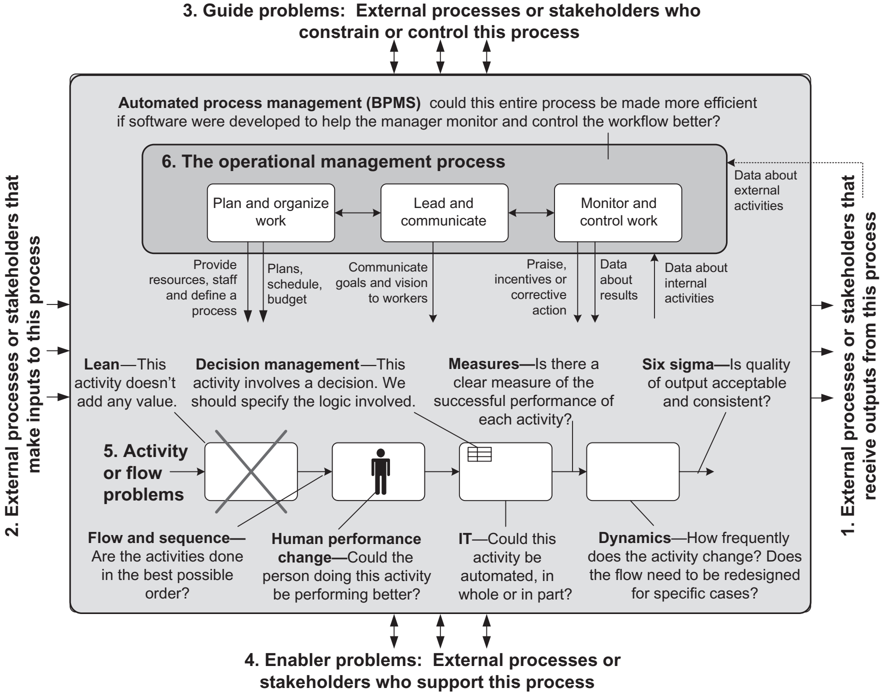
FIGURE 18.5

Enterprise alignment cycle.

or by new technologies that allow the organization to create new products. When relevant changes occur the organization begins a process that results in new business processes with new characteristics, and new management systems that use new measures to assure that the new business processes deliver the required outputs. Organizations can only respond in this manner if all the managers in the organization understand processes. We hope this book will have done a bit to make the reader just such a manager.

Business problem analysis checklist 1

All process redesign problems are divided into one of six broad types: (1) output problems, (2) input problems, (3) guide or constraint problems, (4) enabler or resource problems, (5) activity or flow problems, or (6) process management problems. As a generalization, we identify the majority of the first four types of problems when we create a scope diagram and we define most of the latter two types of problems when we create process flow diagrams.



Each of these six broad problem types can be subdivided into more specific problem categories.

Output Problems

This type of problem occurs because the customer or some other stakeholder of the process isn't getting what is needed. It's possible the outputs are unrealistic, or unnecessary and should be changed, but as things stand the quality, quantity, or timeliness of the outputs of the process-in-scope aren't satisfying one or more relationships. Outputs can take different forms, including physical entities, information or data, or decisions and approvals. In service industries there can be multiple customers, and the nature and frequency of the interactions between the process and customers can be many, dynamic, and very complex.

Quality of Output

- Output is rejected by a quality control process downstream.
- Downstream process refuses to accept output of the process-in-scope.
- Output is returned by customers or other stakeholders.

Quantity of Output

- The process does not produce the number of outputs required.
- The process cannot scale down quickly when a decreased number of outputs are required.
- The process cannot scale up quickly when an increased number of outputs are required.

Timeliness of Output

- Some or all of the needed outputs are not produced when required.

Flow of Output

- Output has no place to go.
- Output isn't used by a downstream process.

Appropriateness of Output

- The value proposition of output isn't understood by the customer.
- Output isn't provided in a way that is convenient for the customer.
- Output requires customers to do things they don't want to do.
- Output isn't as desirable as the product/service offered by a competitor.

Input Problems

This type of problem occurs because the "suppliers" of the process-in-scope aren't producing what's needed by the process-in-scope. As with outputs, inputs to the process-in-scope can be deficient in quality, quantity, or timeliness. Similarly, inputs can take different forms, including physical entities, information or data, or decisions and approvals.

Quality on Inputs

- Inputs are rejected because they don’t meet the quality standards of the process-in-scope.
- Inputs must be returned to an upstream process or supplier.

Quantity of Input

- The supplier does not produce the number of inputs required.
- The supplier cannot scale down quickly when a decreased number of inputs are required.
- The supplier cannot scale up quickly when an increased number of inputs are required.

Timeliness of Inputs

- Some or all of the required inputs do not arrive when needed.
- Inputs arrive in batches and must be stored until needed.
- Inputs are unpredictable and disruptive when they arrive without warning.

Flow of Input

- Input arrives that isn’t used or needed.
- Input arrives with no place to go.

Appropriateness of Input

- Input isn’t structured in a way that is convenient for the supplier.
- Input requires suppliers to do things they don't want to do.
- Providing input isn’t as desirable for the supplier as providing the product/ service for a competitor.

Guide Problems

Guides refer to requirements and constraints that the organization places on a process. Guides are usually policies, business rules, or documents that define what the process should or should not do. Employee manuals and published safety regulations are an example of guides. Reporting requirements and memos sent by accounting or by outside government agencies also constitute guidance.

Process-in-Scope Not Aligned to Organization or Value Chain Strategy

Processes are the way organizations execute their strategies. An organization might decide to pursue a low-cost provider strategy. A given process, however, for whatever reason, might be doing things that assure that its outputs are anything but low cost. This is a strategy alignment problem. Similarly, some processes pursue strategies that are incompatible with the value chain of which they are a part. The assumption is that organization strategy trumps value chain strategy and that value chain strategy preempts process strategy. Process strategies should be changed to assure they actually implement organizational and value chain strategies:

- Organization strategy with regard to the process-in-scope is unclear.
- The process is pursuing a strategy incompatible with the stated organization strategy.
- The value chain strategy is unclear and two or more processes are pursuing uncoordinated or incompatible strategies (e.g., one process is doing something to save money that is costing another process more money).

Problems With Policies or Business Rules

Policies are statements of how an organization intends to do business. Business rules are more specific statements that define how specific situations are to be handled. Logically, business rules should be derived from and aligned with organizational policies:

- Full implementation of stated policies would make it impossible for the process-in-scope to function.
- The process-in-scope consistently ignores one or more organizational policies.
- The process-in-scope consistently ignores one or more specific business rules.
- Individual employees working in the process-in-scope ignore one or more specific policies or business rules.
- The process-in-scope is tasked with implementing incompatible goals or policies.
- The priority of goals or policies that the process-in-scope is tasked with implementing is unclear.
- The priority of goals or policies that the process-in-scope is tasked with implementing can shift rapidly and the process is unable to make the switch quickly or completely enough.

Problems With Documentation, Manuals, etc.

Problems in this area can be closely related to Problem Category 5.2. They usually arise because documentation is out of date and policies or rules in the documentation are wrong, or because two or more sources of information are incompatible:

- Documentation is incomplete, out-of-date, or wrong.
- Documentation is obscure and hard to read or understand.

- Documentation is written in the wrong language.
- Documentation is in the wrong format (e.g., electronic instead of digital, wall poster rather than pocket notebook).
- Documentation is unavailable to people who need it when they need it.

Enabler Problems

Enabler problems occur when the resources needed to perform a process on a day-by-day basis aren't available or don't perform as they should. Enabling resources include the employees who actually perform the activities that make up the process, software systems and infrastructure, facilities and equipment, and in some cases bookkeeping or accounting materials that managers or employees need to perform their work or are required to submit.

Employee Problems

- The process-in-scope is understaffed, or HR cannot find or hire enough employees to adequately staff the process-in-scope.
- The jobs or roles defined for employees assigned to the process do not match the needs and requirements of the process-in-scope.
- The employees lack the skills needed to perform the work required to accomplish the process-in-scope.
- The employees have never been told who is responsible for the various tasks that are part of the process-in-scope.
- The employees lack skills.
- The training provided is inadequate or offered at the wrong times.
- Manuals or other documentation do not offer complete or adequate guidance.
- The rewards or incentives provided for employees do not support the performance required by the process-in-scope.
- The employees lack the time, space, or tools required for the performance of some of the tasks involved in the process-in-scope.
- The employees working on the process-in-scope are given lagging data, but no leading data that they can use to anticipate work, plans, schedule, etc.
- The employees believe that some or all of the performance required by the process-in-scope is unnecessary, not properly part of their job, or shouldn't be performed for whatever reason.

IT Problems

- IT applications require inputs or generate outputs that are out of sync with the actual flow and activities of the process-in-scope.
- Data are required or are generated that are out of sync with the actual flow and activities of the process-in-scope.
- IT applications or tools require inputs or make outputs that are hard to interpret, and thus they are inadequate user interfaces leading to inefficiencies or errors.

- IT applications or tools support normal processing but do not adequately support exception handling, which is a special problem whenever the number of exceptions spike.
- Activities are performed manually that could be more efficiently performed by a software application.
- Data must be input more than once because the software applications being used do not share the relevant data.
- Data or reports provided to employees are inadequate, wrong, incomplete, or out of date.
- Data arrive that require translation or reformatting to be used.
- Data that are required don't arrive, or don't arrive in a timely manner.

Facilities, Equipment, and Location Problems

- Resources or tools required by the process-in-scope are unavailable when they are needed.
- Facilities are inadequate.
- The equipment is inadequate.
- The process-in-scope is geographically distributed, and this causes inefficiencies.
- The layout of the facility causes flow problems or storage problems.

Bookkeeping and Accounting Problems

- Bookkeeping or accounting information required by the process-in-scope is unavailable when it is needed.
- Bookkeeping or accounting input requirements interfere with the performance of required tasks.

Process Activity and Flow Problems

This type of problem occurs because the activities within a process don't work as they should, because the flow between activities isn't well organized, or because the manager responsible for one or more of the activities on a day-to-day basis isn't doing an effective job. In many cases the internal process will need to be diagrammed (e.g., with a Business Process Model and Notation diagram) to clarify the problems.

Subprocess or Activity Problems

- An activity isn't producing the desired output.
- An activity isn't producing anything of value.
- An activity is taking too long.
- An activity costs too much.

- Is the activity well structured, or is it very dynamic? Do performers have to restructure the activity each time it's performed? Is each individual case treated differently?
- Do performers need to consult with others frequently as they solve problems and perform the activity?

Flow Problems

Problems with logical completeness

- Some activities are not connected to other, related activities.
- Some outputs have no place to go.
- Some inputs have no place to go.

Sequencing and duplication problems

- Some activities are performed in the wrong order.
- Some activities are performed sequentially that could be performed in parallel.
- Work is done and then put into inventory until needed.
- Some activities are performed more than once.
- There are no rules for determining or prioritizing flows between certain activities or individuals.

Subprocess inputs and outputs

- The inputs and outputs of subprocesses are wrong or inadequately specified.
- Subprocess inputs or outputs can be of inadequate quality, insufficient quantity, or untimely.
- Subprocesses get inputs or make outputs that are unnecessary.
- Some subprocesses do things that make for more unnecessary work for other subprocesses.

Process decision making

- The process-in-scope or one of its subprocesses is called upon to make decisions without adequate or necessary information.
- The process-in-scope or one of its subprocesses is required to make decisions without adequate or complete guidance from the value chain or organization (e.g., decisions must be made without stated policies or without specific business rules).
- The organization does not have a clear hierarchy of decision models or rules, and some rules conflict with others.

Process and subprocess measures

- There are inadequate or no measures for the quality, quantity, or timeliness of subprocess outputs.
- Subprocess measures are lagging measures and don't provide the process manager or other employees with the ability to anticipate or plan for changes in pace or flow volume.

Problems With the Management of a Process

This type of problem results from the activities of the individual responsible for managing the process on a day-by-day basis, or from management systems that place constraints on the individual managing the process. Some managers may know they are responsible for managing a process. Other managers may think of themselves as a functional manager—a regional sales manager, or a factory or line manager—and may not have the knowledge or skills needed to manage a process effectively. (In any case they are all employees and the same general considerations apply to managers as to any other employees.)

Day-to-Day Management Problems

The managers or supervisors who oversee the day-to-day operations of specific processes are employees who are associated with the process. They enable the process, and their management practices help determine the success, smooth functioning, or the failure of the process-in-scope. Day-to-day managers are often a source of problems. Here are some typical day-to-day management problems.

Planning and organization problems

- The manager does not have a clear plan for the process.
- The manager's schedule is unrealistic.
- The budget, resources, or staffing are unrealistic.
- Budget information isn’t correct or available as needed.
- Known flows in process are ignored.
- The process manager working on the process-in-scope is given lagging data, but no leading data to use to anticipate work, plans, schedule, etc.

Communication problems

- The employees don’t understand the goals of the process.
- The employees don’t believe management is committed to goals.
- The employees have conflicting goals or incentives.
- The manager doesn’t communicate with upstream, downstream, or support managers.
- The manager doesn’t communicate changes to the process when they are required.

Monitoring and control problems

- Managers do not have appropriate information (measures) on the performance of the process.
- Managers do not know how senior managers will be evaluating the success of the process (or the performance of the manager).
- Employees working on the process-in-scope are not held responsible for achieving one or more key process goals.

- The employees working on the process-in-scope are punished for pursuing one or more key process goals.
- The employees working on the process-in-scope are not given adequate information about the performance of the process he or she is responsible for managing.
- The employees working on the process-in-scope are given lagging data, but no leading data that they can use to anticipate work, plans, schedule, etc.
- The employees working on the process-in-scope are either not rewarded for achieving key process goals, or they are punished for achieving key process goals (e.g., the employee who works the hardest to assure that the process-in-scope meets a deadline is given more work to do).

Manager's goals and incentives conflict

- The process manager is trying to achieve functional and departmental goals that are incompatible with the goals of the process-in-scope.
- The process manager does not have the authority, budget, or resources required to effectively manage the process-in-scope.
- The process manager is not held responsible for achieving one or more key process goals.
- The process manager is punished for pursuing one or more key process goals.
- The process manager is not given adequate information about the performance of the process he or she is responsible for managing.

Management Problems Caused by Higher Level Managers

- External management processes require information that the process-in-scope is unable to provide.
- External management processes provide information or directions that the process-in-scope is unable to use or implement.
- External management uses measures not aligned with process goals.
- External management does not provide feedback about downstream results.

Note that accounting processes, such as budgeting and forecasting, are either management processes and fall under guidance (i.e., they provide managers and employees with information to guide their decisions), or they are support processes, in the sense that accounting data are information that the individual process manager needs to do his or her job.

APPENDIX

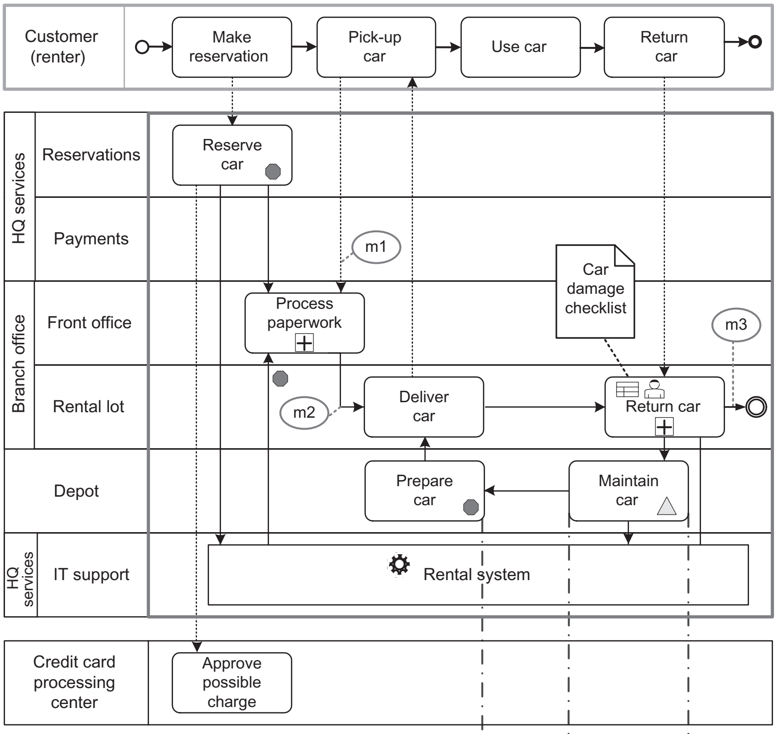
Core business process modeling notation 2

There are many process notations that have been used over the years to represent more complex process flows. The one that has the most support today is Business Process Model and Notation (BPMN, Version 2.0), which was developed by representatives of the leading business process modeling vendors under the auspices of the Business Process Management Initiative, the business process interest group of the Object Management Group (OMG), an international standards organization. BPMN comes in two versions: a core notation set that can be used by business people, and an extended notation set that provides the details to represent processes for automation. In BPTrends classes we only use the core BPMN symbol set. This core set is identical to OMG's unified modeling language activity diagram notation and nearly identical to the Rummler-Brache notation, and is thus as close to a universal notation as exists today.

Overview of a BPMN Diagram Used for Business Process Analysis and Redesign

In business process modeling for redesign, we usually begin with a diagram of process as it currently is—the As-Is process—and then generate one or more To-Be redesigns to explore possibilities.

The customer process



Management structure

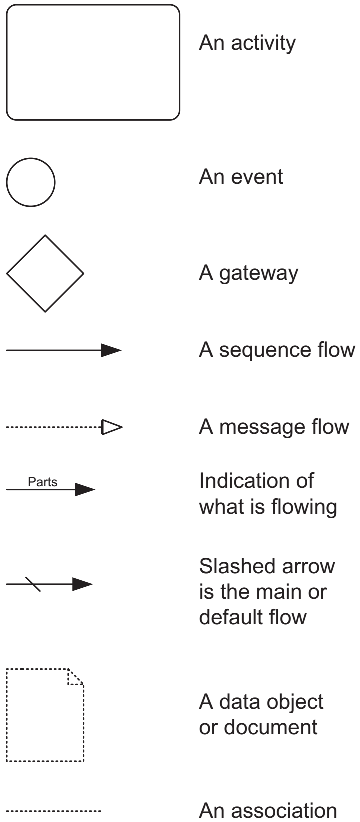
The labels for the swimlanes should reflect the management structure of the organization that owns the process. At various levels of decomposition, the boxes may represent divisions, departments, managers or supervisors. Horizontal labels can show reporting relationships.

Ave. time activity takes

Time between the completion of one activity and the start of the next

Subprocess/activity times can be shown at the bottom of the BPMN diagram by inserted dashed lines

The core BPMN symbols are as follows:



An Activity

A generic term for work that a company performs. Activities take time. Activities can be composed of activities. Complex activities include value chains, processes, and subprocesses. Specific activities include tasks.

An Event

An event is something that happens during the course of a business process. An event is a point in time. Events include triggers that start processes, messages that arrive that disrupt processes and the final production of products, services or data that result in the end or termination of a process or subprocess. In extended notation, symbols can be placed within the circle to specify things about the nature of the event.

A Gateway

A gateway is used to show the divergence or convergence of a sequence flow. This might indicate forking or merging activities, or it might indicate a decision that determines which of two or more subsequent flows is to be followed. In extended notation, symbols are placed within the diamond to specify things about the gateway. They might indicate, for example, that all preceding activities need to be done before the next activity occurs.

A Sequence Flow

An arrow is used to show the order that activities will be performed in a process. A sequence arrow does not imply that physical output, information, or people move from one activity to the next, although they may. It simply suggests that a subsequent activity is performed next in the normal course of accomplishing the process. Labels can be associated with the flow arrows to indicate when decision paths are being followed or when things or information is flowing along the arrow.

If useful, you can write the name of what is flowing via a particular arrow above or below the arrow.

If there is more than one flow from a given activity you can use a slash to indicate which flow is the main or default flow path.

A Message Flow

A dotted arrow is used to show flows between activities in separate pools. (This is misnamed, since the flow can be a message or a thing like a product or a service.)

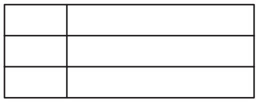
A Data Object

Data objects are artifacts that do not have a direct effect on the sequence flow or the message flow of processes. They provide information that activities require to produce what they produce.

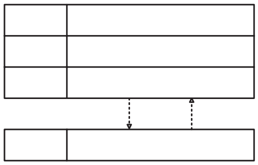
An Association

An association is used to associate text or other annotations to activities or arrows on a diagram.

A pool with swimlanes



Two pools



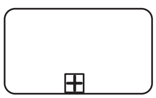
A Pool With Swimlanes

A pool provides a context for a set of activities. Departments, roles, or participants are described in the boxes on the left. Activities and flows are indicated in the rectangles on the left. The top swimlane is normally reserved for the customer of the process.

Two pools are used to indicate the organizations or individuals within separate organizations that are coordinating their work on a common process.

In extended BPMN some of the elements in the core notation are "extended" to provide more information. Some graphical examples follow.

A Few Extensions of the Activity Rectangle



Box with plus indicates that there is a diagram of the decomposition of this activity.

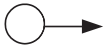
 Process/activity is done by a person (manual)

 Process/activity is done by a machine/computer (automated)

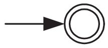
 Process/activity uses business rule to make a decision (decision point)

 Process/activity is repeated until the correct result is obtained

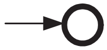
A Few Extensions of the Event Circle



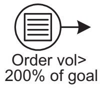
Initial event



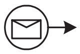
Intermediate event



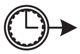
Terminal event



Trigger is business rule

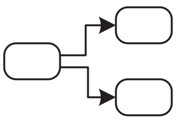


Trigger is message

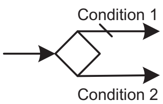


Trigger is a point in time

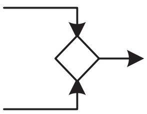
A Few Extensions of the Gateway Diamond



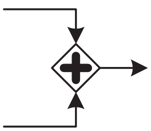
Parallel processing. The flow divides and the same information goes to both subsequent activities. No decision required.



Decision. Only one path is followed by a given flow—either condition 1 applies OR condition 2 applies.



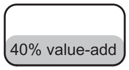
Merge (OR-Join). The flow continues when **one** of the possible inputs arrives.



Merge (AND-Join). Process only proceeds when inputs from **both** streams are joined together.

Some Other Notations That We Occasionally Use

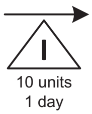
Lean/value-add notation



Shading. We fill a portion of an activity box with gray shading to show how much of the activity adds value

A normal arrow shows that the flow is pushed.

A very bold arrow shows that the flow is pulled by the downstream activity



A triangle under an arrow with an I indicates that inventory is maintained and shows how much and how long inventory is held between activities.

BPTrends Special Notation

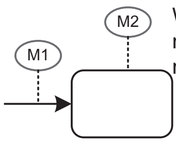
BPTrends special notation

Symbols that we place on the As-Is process diagram to indicate where problems do or don't occur.


Should be analyzed and changed


Analyze and maybe change


Ignore for this subprocess/activity



We can indicate where we plan to gather data to monitor the process with this notation. Each measure is numbered.

Business process standards 3

Most people in the majority of companies don't care about standards. They simply do their jobs without thinking about the fact that their work is greatly simplified by the many common agreements about how things are to be done. It doesn't make any difference whether we drive on the right or the left side of the road, but it's a huge convenience that everyone within a particular geographical area agrees to do one or the other. Similarly, we all benefit by having a limited number of screw formats, so that two sets of screwdrivers will work in almost all cases.

We have discussed Geoffrey Moore's technology adoption life cycle model in other chapters. The model is pictured in Figure A3.1. In essence, innovators take new technology from universities and labs and try to use it to make breakthroughs that will give them significant competitive advantage. They are willing to invest significant resources to figure out how to make the technology work for them. Early adopters take technologies that are a little further along and try to develop applications before their competitors do, and thus gain advantage. Like innovators, early adopters have strong technology groups. Early majority companies wait until after a technology has proven itself, and then they adopt the new technology. But early majority companies don't expect to have to develop new technology or struggle with immature tools. More importantly, for our purposes here they expect standards to be in place. In other words, standards development at least in technological domains is an activity

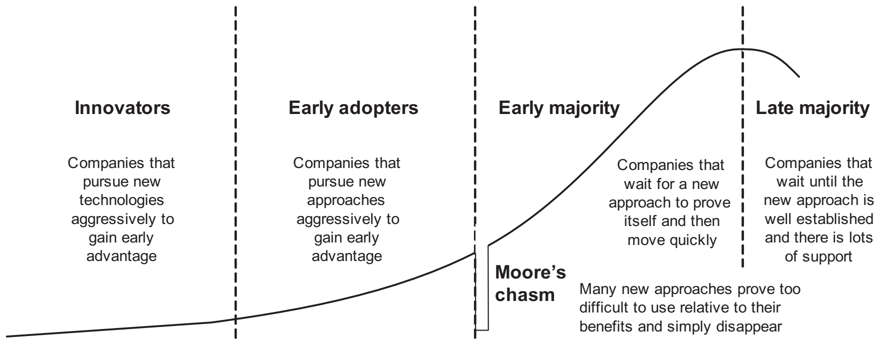


FIGURE A3.1

Geoffrey Moore's Technology Adoption Life Cycle.

From Geoffrey A. Moore, Crossing the Chasm, HarperBusiness, 1991.

that is carried on by vendors and sophisticated users during the early adopter phase of the technology life cycle. It isn't something that most companies are interested in working on—they expect it to be completed by the time the technology is ready for widespread use. In some cases technologies that fall into the chasm and disappear are those that fail to develop workable standards during their early years. The problem with this neat and orderly approach, however, is that the business process management (BPM) market is actually a number of different markets. Some like process modeling are already quite evolved, whereas others like process mining are just coming out of university labs. Thus BPM standards can be a confusing area.

The first thing to consider is the nature of the standard. Some standards are published documents, certified by groups like the International Standards Organization (ISO) and supported by national governments and large companies. Other standards are promulgated by professional associations. Their importance depends on the prestige of the professional group. Still other standards are offered by vendors who urge those using their methodologies or software products to adopt certain conventions to simplify communication among users. If the vendor is IBM or Microsoft, such a recommendation may have quite a bit of clout.

The difference between standards offered by ISO and those offered by a vendor is sometimes discussed by speaking of de facto and de jure standards. De jure (in law) standards are established by governments, standards groups, or industry consortia. De facto (in practice) standards are defined by communities without any formal agreement. Windows is the Microsoft operating system that over 80% of PC users depend upon. It is the de facto standard for PC operating systems, and any vendor that wants to sell software for PCs would be well advised to support it. In complex and rapidly evolving environments de facto standards are often more important than de jure standards, which usually take longer to develop. Put somewhat differently, if leading vendors can't agree on a common standard they let the market decide, and the vendor that achieves the de jure standard wins.

Another important standards issue involves the availability of documentation and tests. We have already mentioned that some standards issue formal standards documents—often called specifications. Some organizations publish books that describe their standards. Recently it has become popular to speak of a *body of knowledge* (BoK)—an informal specification or book that describes a collection of best practices supported by a single organization in a single domain. The BoK may describe alternative ways of accomplishing a goal. Thus a BoK is not so much a precise standard, but more a collection of best practices. Thus the International Institute of Business Architects (IIBA) publishes a BoK the describes best practices for business architects.

In the same way, many professional organizations offer certification exams. In effect, these examinations are more or less rigorous tests and the certifying body usually ends up offering successful candidates some kind of certificate and the right to add some kind of initials to their business card. In some countries certification isn't very important, but in other countries it is very important, and promotions depend on individuals passing certification examinations.

With these considerations in mind we want to spend a few minutes considering standards in the business process world today. To organize the discussion a bit more we'll divide standards into three broad sets, according to who uses them. *Organization level* standards are used by business managers to assist in analyzing and organizing enterprise initiatives. *Business process* standards are used by business managers and business process practitioners when they undertake business process change projects. This area is the most difficult to organize because the individuals who undertake business projects vary so much. In some cases business managers and employees undertake business improvement projects. In other cases business analysts and other IT-oriented individuals undertake process automation projects. Finally, *implementation* standards are specific to technologies used by those charged with developing solutions to process problems. Most of the standards in this area are IT standards that structure how software is developed or how software tools interface with each other.

We can hardly consider all the business process standards that exist or are being developed today, but we want to provide a high-level overview. Obviously, we have structured the discussion and assigned standards to categories that reflect my experience. Others would surely arrange some of these standards differently, and several of the standards that we consider in one category could just as well be placed in another category. But we need to simplify a bit to provide an overview. This can be done by not considering standards offered by vendors, but by only focusing on standards offered by international standards groups or professional associations. We will mention some de facto standards that are usually only documented by vendor materials, but we will focus mainly on standards backed by published documentation or by a published BoK or certification program.

Organization-Level Business Process Standards

Organization-level business process standards are used by executives and senior business managers to help organize their overall understanding, evaluation, and management of a business's performance. In addition, some organizations have BPM groups that report to executive committees, and they use enterprise-level standards as tools to do manager evaluations and to prioritize process interventions.

Probably the most widely used business process standard at the enterprise level is Kaplan and Norton's Balanced Scorecard approach to managerial evaluation. This is a de facto standard and predictably takes many forms. The various spin-offs of Kaplan and Norton's approach have enough in common, however, that most companies can immediately answer "yes" or "no" if asked if they are using a Balanced Scorecard approach.

The most impressive business process standard at the enterprise level is probably the Supply Chain Council's Supply Chain Operations Reference (SCOR) framework and methodology. SCOR was developed by supply chain managers as a tool they could use to build and evaluate multicompany supply chain processes. More information is available at http://supply-chain.org.

The eBusiness Telecom Operations Map (eTOM) business process framework is another framework that is tailored for the telecom industry by the TeleManagement (TM) Forum. The TM Forum offers certification in the use of eTOM.

The Europeans have a quality standard for organizations, the European Foundation for Quality Management excellence model, which is attracting a lot of attention on the part of companies that are doing process architecture work in Europe, although it has not yet reached the United States. More information is available at http://www.efqm.org.

Another standard that is sometimes used at the organization level is the Software Engineering Institute's (SEI) Capability Maturity Model Integrated (CMMI). Most companies use CMMI to evaluate the performance of their IT processes, in which case CMMI would be a process-level standard. A few organizations, however, use it to evaluate all their business processes to determine how the entire organization is evolving, and in those cases it can function as an enterprise-level tool. Information on this standard is available at http://www.sei.cmu.edu/cmmi. Books and certification are available. Although SEI's CMMI is the de facto standard in the area of process maturity, several other organizations offer process maturity models, and some are more practical and easier to administer.

The US government's various agencies rely on the Federal Enterprise Architecture Framework (FEAF). FEAF is potentially an enterprise tool, and is used that way by a few agencies. More information is available at http://www.whitehouse.gov/omb/e-gov/fea.

We've summarized some of the business process standards we're considering in Figure A3.2.

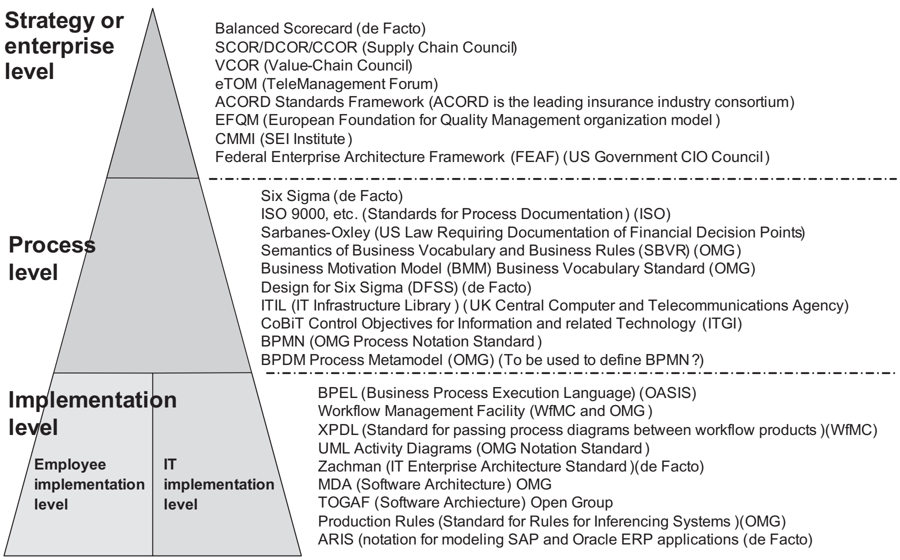


FIGURE A3.2

Some business process standards organized by users.

Process-Level Business Process Standards

The process level is all about business process redesign and improvement projects. The standards on this level help managers, employees, business analysts, and human performance analysts change how specific processes work.

By far the most important standard at the process level is Six Sigma, another de facto standard that is defined differently by different companies and standards groups. Most of the variations on Six Sigma, however, bear enough of a family resemblance to be easily identified. Six Sigma provides a generic process improvement methodology DMAIC (Design, Measure, Analyze, Improve, and Control) and a large collection of tools that process improvement teams can use to improve processes. Most Six Sigma books suggest that Six Sigma practitioners consider using BPM, process redesign using Design for Six Sigma (DFSS), and process improvement using DMAIC. In reality, most Six Sigma practitioners are focused on DMAIC. The most respected versions of Six Sigma standards are those found in the American Society for Quality (ASQ's) handbooks and certification exams (the ASQ is a professional association). More information on ASQ BoK and certification is available at http://www.asq.org.

Lean represents a separate methodology that focuses on eliminating waste from process flows and is now often considered one of the tools that Six Sigma teams ought to employ—so some prefer to talk of "Lean Six Sigma." ASQ certification uses this term. However, ASQ documentation doesn't do justice to the approach that Lean practitioners trained in the Toyota Production System employ, and there is no group that offers widely accepted Lean certification. More information on Lean is available at http://www.lean.org (the website of the Lean Enterprise Institute) or in books published by Toyota.

Almost as widespread as Six Sigma is the ISO 9000 standard. (This standard has many variations on 9000, but most people recognize it by this designation.) In essence, ISO 9000 is the ISO specification for defining business processes. Many leading European firms and governments require companies to define their processes using ISO 9000. Unfortunately, this standard has become a "checklist" item and most companies create their ISO 9000 documentation rapidly and then shelve it. There are efforts under way to make ISO 9000 more meaningful for modern business process work, but at the moment ISO documentation has little impact on how processes actually work at companies. More information is available at http://www.iso.org/iso/iso_9000.

The Object Management Group (OMG) is a standards body that is most active in the development of software standards, but it has recently become active in other areas of process modeling as well. At the organization level the OMG has published standards like the Business Motivation Model that proposes standard relationships between terms like goal, objective, and process, and the Value Delivery Modeling Language, a standard concerned with how organizations speak about the value of processes. At the process level the OMG has such standards as Business Process Model and Notation (BPMN), its new Case Management Model and Notation, and its business rule standard Decision Model and Notation. The OMG has many other standards that fall closer to implementation issues.

The OMG offers certification in all its process standards. In essence, this certification says that an individual understands a variety of the OMG's process specifications. More information is available at http://www.omg.org/omg-certifications.

The professional group within the process field that has been working on both a BoK and certification is the Association of Business Process Management Professionals. The group is international in scope. It has been slow in gaining much recognition, but now has a published BoK and is offering certification examinations. More information is available at http://www.abpmp.org.

As interest in process analysis and redesign grew in the 2000s business analysts became more active in process work. At the same time, a new professional organization, the IIBA, emerged and developed both a BoK and a certification that has been fairly popular. Although much of the focus of business analysts is on software requirements and software implementation issues, there is a core of process analysis practice that is captured in their certification program. More information is available at http://www.iiba.org.

There are several business frameworks in industry- or domain-specific areas that are useful in helping a process team design or evaluate existing business processes. Good examples are the Information Technology Infrastructure Library, a standard for IT support processes, and the Control Objectives for Information Technology, a standard for IT management processes. Both are of growing interest to companies that want to standardize their IT processes throughout the company.

Of all the standards in the process area the one that has had the most success in recent years is the OMG's BPMN standard. Nearly every vendor has adopted this process flow notation, and it is now the most popular way to describe processes. Those who work primarily with enterprise resource planning (ERP) software still tend to use ARIS diagrams, but even these diagrams are beginning to be replaced by BPMN is many areas.

Business Process Standards for Implementation

Once a business team has redesigned a process there are various groups that can become involved in preparing for implementation. HR teams may be asked to develop new job descriptions, hire new people, or retrain existing employees. IT groups may be asked to develop software. Corporate property management groups may be asked to relocate plants, buy new trucks, or build new distribution centers, etc.

Most of the business process standards in the implementation area at the moment are IT standards. They are either designed to help IT professionals gather business requirements and design or tailor software applications, or they are designed to assure that companies can store process information in a common data format or pass models from one software tool to another. Most of the IT standards for BPM have been created by the OMG, which we have already mentioned. Other groups involved, however, include OASIS (Business Process Execution Language) and the Workflow Management Coalition. A group that is involved in enterprise architecture and indirectly in business architecture is Open Group's architecture standard TOGAF (The Open Group Architecture Framework).

Zachman's Enterprise Architecture is the de facto standard for enterprise architects focused on cataloging the IT assets of a company, but causes no end of confusion when people mistake it for a business process architecture standard and try to use it as a business management tool.

Finally, ARIS (Software AG's notation and tool) is the de facto notation for diagramming ERP applications. It is used by SAP for their diagrams and has been adopted by Oracle and Microsoft. In its ERP form it's a notation that only software developers understand, and underlines the need for a different notation for business managers. It is, however, widely used by IT developers working on ERP-based process implementations. Just don't plan on showing an ARIS diagram of your new ERP application to your CEO.

The Future of Standards

We've only considered a few of the many standards being used by business process managers and developers. The variety is impressive. Key to developing standards is understanding what group will use them and what activities will be facilitated by the existence of a standard approach. When IT tries to get business people to use one of their software-oriented standards it usually leads to an unsuccessful project. Similarly, when business people provide process models to IT, developed in one of their preferred notations, it usually means that the requirements are insufficiently specified. These problems will only become more complex as companies try to figure out how to use business process management software (BPMS) tools and create BPMS applications.

We are happy that BPMN has emerged as a common language for diagramming business process flow, and we expect that other process standards will become similarly widespread in the coming decade.

APPENDIX

Processes and capabilities 4

There has been much discussion on the relationship between *processes and capabilities*. We can't offer a definitive solution to this ongoing debate because some of the definitions of "capabilities" are incompatible with one another. What follows, however, is our take on what we believe to be the most useful approach to defining and using capabilities in a process-focused environment.

Let's start with some definitions.

Process (business process). A business process describes how work is accomplished in an organization. The work performed in a business process transforms physical or informational inputs into outputs. A business process is comprised of a set of activities, each of which may have its own set of activities. The complete set of business processes of an organization describes all the work undertaken by that organization. A business process may be comprised of highly structured and repetitive work or be loosely structured and exhibit high variation.

In other words, when we use the term business process we are referring to both large-scale processes, such as value chains and value streams, and to small-scale processes, such as tasks and activities. Similarly, we are speaking of both well-defined procedural processes and loosely defined sets of activities used in "case management." All are variations on business processes.

In essence, a business process describes *how* things are done, but it includes a description of the process output, which describes *what* results from execution of the process. We name processes by combining a verb and a noun. Thus, for example, a process might be named: *make and sell pizzas*. If we wanted to represent the process graphically we would picture the process as a rectangle with rounded corners and we would show inputs on the left and outputs on the right, as in Figure A4.1.

Capability. The *Compact Oxford English Dictionary* defines capability as "the power or ability to do something." In a business context capability describes something that an organization is able to do.

We name a capability by saying that an organization *has the ability to produce something*, or is *able to do something*. Thus we might say that our pizza company *has the (cap)ability to produce pizzas*, or is *able to produce pizzas*.

Getting even more specific a capability describes the ability to generate something that results from execution of a specific process. Or, if you prefer, it describes what would result if a process were to be executed. Ultimately, without describing the process, you won't know what you mean when you say the organization is "able to produce a pizza." The process describes the content of the capability claim.

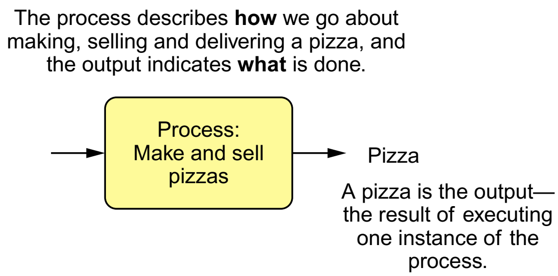


FIGURE A4.1

Simple model of a process.

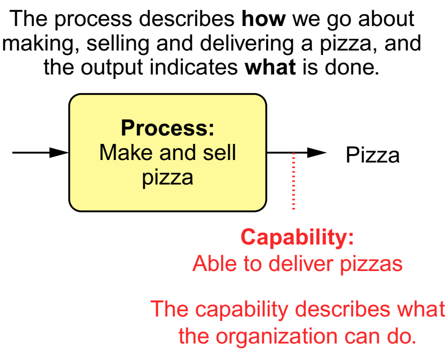


FIGURE A4.2

A process and a capability.

Thus a particular organization might say that it *has the ability to produce pizzas*. A capability *does not* describe *how* to do it, but simply states that an organization could generate a particular result if an appropriate process were executed. We might modify Figure A4.1 to picture this, as in Figure A4.2.

Note that we are *not* saying that a capability is an output or a specific result. A capability is an *ability to generate an output or a result*. Capabilities stand between *processes*, which describe how to do work, and *results*, which describe what is produced. Thus, capabilities are a kind of shorthand for describing something an organization can do. For graphic purposes we find it convenient to represent a capability as an output arrow, which lies between the process box and the named output.

As a strong generalization we don't discuss capabilities much when we talk about process redesign or improvement. Capabilities are usually used in discussions of *business architecture*. They provide a shorthand way for business people to talk about what they want a group or organization *to be able to do*.

Some Corollaries

It is possible to describe abilities or results without specifying how to produce those results. This happens when an entrepreneur announces that he wants to create a company to produce widgets. The entrepreneur knows what he wants the new organization to be able to do, but may not yet know how to do it.

Similarly, it is possible to produce a desired result in more than one way. Thus it's possible to list some things that you would like an organization to be able to do, without knowing what process you will use to produce the desired result. It's possible to speak of an organization that can deliver pizzas in more than one way (e.g., via bike messenger or delivery truck). Or, perhaps the company will subcontract delivery to another organization. Thus it's possible to create a list of the capabilities an organization might have, or desire, without having a list of the processes required to produce the desired results. This can be useful when managers want to talk about new projects. Such a manager might say something like: "If we are going to be able to produce widgets, we will need to be able to machine both aluminum and plastic parts."

There's nothing wrong with using *capability statements as a kind of shorthand* in a management discussion. Eventually, however, one will need to get more specific and define how one will machine aluminum and plastic parts, and then set up some trials to be sure you can in fact produce the desired results in an efficient and consistent manner. In other words, you might start with statements of capabilities and talk about desired results, but sooner or later you will need to shift to talking about how the processes needed to assure that you really can implement your desired capabilities. This is especially important when one is concerned with improving such a process, or considering ideas to replace or significantly change the process, or to understand the potential inherent to a process (i.e., to apply capabilities to do new things).

Processes, Capabilities, and Business Architecture

We already said that the term "capabilities" isn't much used in discussions of process redesign, but it is commonly used in discussions of business architecture. Let's consider how we might use either a process or a capability in the creation of a business architecture. In Figure A4.3 we picture a bank process architecture. This architecture pictures all the Level 1 and some of the Level 2 processes in a single value chain: *provide customer products and services*.

What is really important here, given our discussion of the difference between processes and capabilities, is that when we work with managers to develop architecture, we do not define *how* the various processes will work! Instead, during our initial discussion we simply use what we informally refer to as *process names* as a shorthand for the processes that make up a value chain.

This brings us to a key point: How is a *process name* different from a *capability*? We could quibble about the fact that process names emphasize how we do things (verb-noun) and capability names refer to something the organization can do (able to do x),

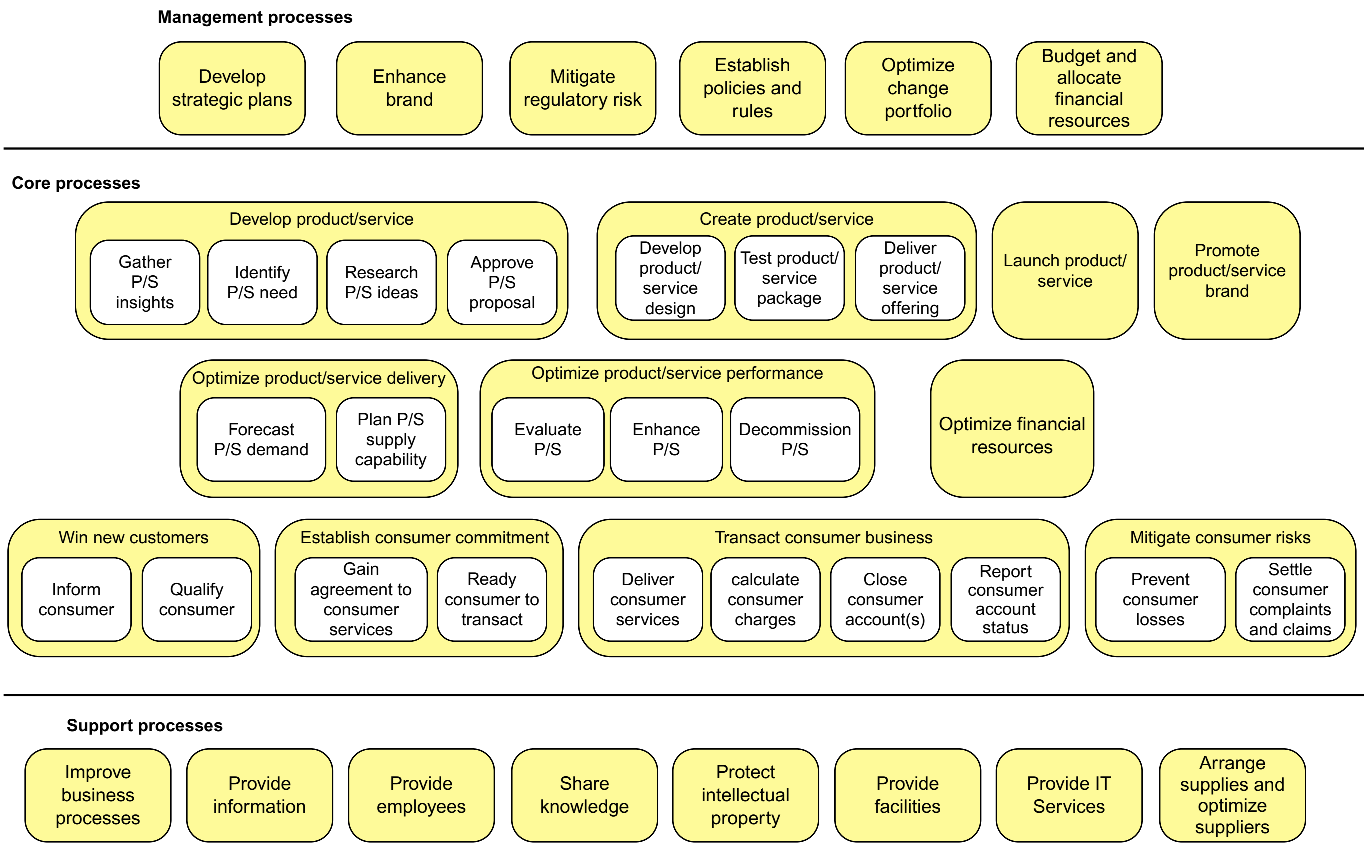


FIGURE A4.3

A business process architecture showing two levels of processes.

but that's really a pretty trivial distinction at the level of abstraction we are dealing with here. In fact neither a process name, as used in most process architectures, nor a capability statement describes how something is done. They simply indicate that the organization is or should be able to do something. *In other words, at the business architecture level process names and capability statements are essentially the same!*

We think one of the reasons that there has been so much confusion about processes and capabilities is that people haven't been clear what they are actually talking about. Many of those contributing to these discussions come from the IT side of their organizations, and tend to think of processes rather concretely—as specific flow diagrams that software developers might automate. Thus for those individuals something more abstract like capability statements is needed for architectural work. Many process people, however, have been developing business architecture for decades—check Geary Rummler's book, *Improving Performance*, which was published in 1990 if you are in any doubt of this—and process architects have always used process names just as we have described them above. When someone starts to talk about "processes" as if they always describe *how*, and ignore the fact that process people often use *process names* as shorthand to suggest what an organization is able to do, then you have confusion.

In fact process names and capability statements are just two different ways of describing the same thing. Consider Figure A4.4, where we show one bit of the business process architecture from Figure A4.3. The diagram shows a hierarchy. A Level 1 process like *create product/service* is composed of three subprocesses, which are pictured inside the larger process box. Below the process rectangle, we show there is one Level 1 capability associated with the Level 1 process and there are also three Level 2 capabilities, one associated with each of the subprocesses that make up

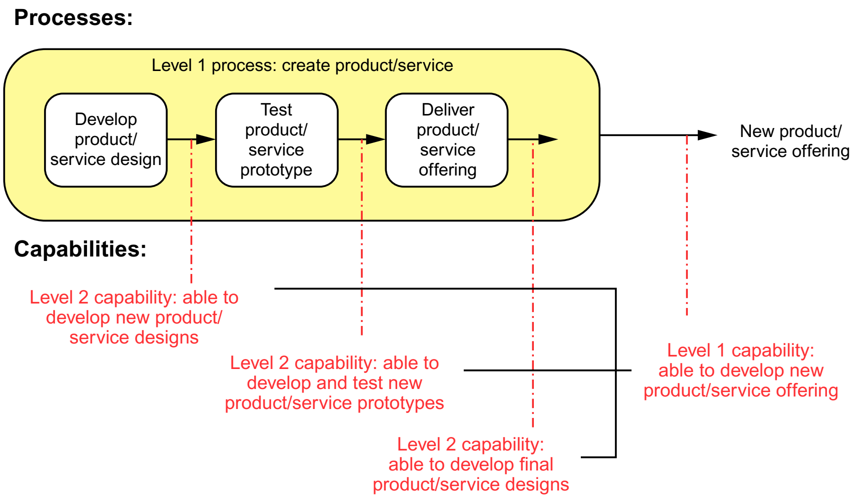


FIGURE A4.4

A process hierarchy and its equivalent capability hierarchy.

the Level 1 process. We also show how one could create a map of the relationship between the three Level 2 capabilities and the Level 1 capability.

Once we focus on how people are actually using the term "capability" and what they are actually doing when they generate hierarchies of capabilities we find that they are doing exactly the same thing that most process analysts do when they create a business architecture using "process names."

Obviously, many process people will wish to continue using an approach that they have used for decades. We prefer to build business process architectures using "process names" to designate the processes an organization must control. Those who are unfamiliar with using process names to describe high-level processes apparently prefer to speak of "capabilities." As long as everyone realizes that it doesn't make any real difference—that both are just a shorthand way for business people to discuss what they want their organizations to be able to do—there shouldn't be any problems. Since it doesn't make any real difference in practice we can only hope that the arguments between those who prefer "processes" and those who prefer to speak of "components" will blow over in the near future and we can all get back to helping business organizations improve their performance.

APPENDIX

Process analysis diagrams used in this book

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In this appendix we provide a list of the diagrams in the book that students might draw or create using business process management software tools in the course of analyzing how a business process works. They are listed in the order in which they are introduced in the book.

Simple process diagram pp. 2, 180, 188, 346

Simple organization chart pp. 56, 129

Organization diagram pp. 62, 66, 155 (Created by Geary Rummler, who called it a supersystem diagram or a relationship map.)

Simple process architecture pp. 80, 89, 100, 165, 345

Scope diagram pp. 190, 192, 194, 197, 198, 204, 268, 349, 351, 358, 377 (Derived originally from integrated definition, or IDEF, methodology and termed an IDEF0 diagram it was extended to its present form by Roger Burlton, who termed it an IGOE diagram. It has been extended further by BPTrends to become a scope diagram.)

Cause-effect diagram pp. 191, 302, 350 (Also called a fishbone diagram or an Ishikawa diagram.)

BPMN process flow diagram pp. 210, 211, 215, 217, 218, 219, 220, 222, 224, 242, 243, 248, 270, 352, 353, 357, 358, 361, 363, 377, 400, 405 (Created by Geary Rummler, and often called a Rummler-Brache diagram, it shows a process flow diagram with the activities divided into swimlanes, labeled to show who is responsible for each swimlane. Traditionally, a customer swimlane is added at the top. Note that the customer could be another business process. IBM used Rummler-Brache diagrams for a while and called them LOVEM diagrams. This diagram has now been formalized by the Object Management Group and is a diagram used in their Business Process Model and Notation, or BPMN.)

CMMN process diagram p. 227 (An Object Management Group Case Management Model and Notation, or CMMN, diagram used to show a group of activities within dynamic processes that are loosely connected.)

DMM decision diagram p. 252 (An Object Management Group Decision Management Model, or DMM, diagram used to show how groups of business rules are related to specific processes in which decisions are made.)

SIPOC diagram p. 293 (A simple process diagram often used in Six Sigma projects. Stands for Suppliers-Inputs-Process-Outputs-Customer.)

Value stream map p. 307 (A circular flow diagram of a process that begins with a customer request and ends with the delivery of whatever the customer requested. Commonly used by Lean practitioners.)

Stakeholder diagram p. 347 (Extension of a simple process diagram designed to show the stakeholders of a process.)

BPMN/use case diagram p. 364 (*Use case* diagrams were originated by Ivar Jacobson in conjunction with object-oriented analysis, and later formalized by the Object Management Group. The diagrams show how software will be used by those using it. We have extended it to fit within a Business Process Model and Notation, or BPMN, process flow diagram to allow process analysts to identify and define where software applications could be used in a business process.)

Process relationship diagram (Extension of a simple process diagram that shows other core, management, and support processes that interface with the process-in-scope.)

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Note: Page numbers followed by *f* indicate figures and *t* indicate tables.

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About the Author

Paul Harmon is a cofounder and executive editor at Business Process Trends, an internationally popular website that provides a variety of free articles, columns, surveys, and book reviews each month on trends, directions, and best practices in business process management. He is also a cofounder, chief methodologist, and a principal consultant of BPTrends Associates (BPTA), a professional services company providing executive education, training, and consulting services for organizations interested in understanding and implementing business process management. Mr. Harmon serves as a Senior Consultant for AI with Cutter Consortium.

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