Management

Process Management

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SECTION 6
PROCESS MANAGEMENT

James F. Riley, Jr.

INTRODUCTION

Why Process Quality Management? The dynamic environment in which business is conducted today is characterized by what has been referred to as "the six c's:" change, complexity, customer demands, competitive pressure, cost impacts, and constraints. All have a great impact on an organization's ability to meet its stated business goals and objectives. Traditionally, organizations have responded to these factors with new products and services. Rarely have they made changes in the processes that support the new goods and services.

Experience shows that success in achieving business goals and objectives depends heavily on large, complex, cross-functional business processes, such as product planning, product development, invoicing, patient care, purchasing, materials procurement, parts distribution, and the like. In the absence of management attention over time, many of these processes become obsolete, overextended, redundant, excessively costly, ill-defined, and not adaptable to the demands of a constantly changing environment. For processes that have suffered this neglect (and this includes a very large number of processes for reasons that will be discussed later in this section) quality of output falls far short of the quality required for competitive performance.

A business process is the logical organization of people, materials, energy, equipment, and information into work activities designed to produce a required end result (product or service) (Pall 1986).

There are three principal dimensions for measuring process quality: effectiveness, efficiency, and adaptability. The process is *effective* if the output meets customer needs. It is *efficient* when it is effective at the least cost. The process is *adaptable* when it remains effective and efficient in the face of the many changes that occur over time. A process orientation is vital if management is to meet customer needs and ensure organizational health.

On the face of it, the need to maintain high quality of processes would seem obvious. To understand why good process quality is the exception, not the rule, requires a close look at how processes are designed and what happens to them over time.

First, the design. The western business organization model, for reasons of history, has evolved into a hierarchy of functionally specialized departments. Management direction, goals, and measurements are deployed from the top downward through this vertical hierarchy. However, the processes which yield the products of work, in particular those products which customers buy (and which justify the existence of the organization), flow horizontally across the organization through functional departments (Figure 6.1). Traditionally, each functional piece of a process is the responsibility of a department, whose manager is held accountable for the performance of that piece. However, no one is accountable for the entire process. Many problems arise from the conflict between the demands of the departments and the demands of the overall major processes.

In a competition with functional goals, functional resources, and functional careers, the cross-functional processes are starved for attention. As a result, the processes as operated are often neither effective nor efficient, and they are certainly not adaptable.

A second source of poor process performance is the natural deterioration to which all processes are subject in the course of their evolution. For example, at one railroad company, the company telephone directory revealed that there were more employees with the title "rework clerk" than with the title "clerk." Each of the rework clerks had been put in place to guard against the recurrence of some serious problem that arose. Over time, the imbalance in titles was the outward evidence of processes which had established rework as the organization's norm.

The rapidity of technological evolution, in combination with rising customer expectations, has created global competitive pressures on costs and quality. These pressures have stimulated an exploration of cross-functional processes—to identify and understand them and to improve their performance. There is now much evidence that within the total product cycle a major problem of poor process performance lies with process management technologies. Functional objectives frequently conflict with customer needs, served as they must be by cross-functional processes. Further, the processes generate a variety of waste (missed deadlines, factory scrap, etc.). It is not difficult to identify products, such as invoice generation, preparation of an insurance policy, or paying a claim, that take over 20 days to accomplish less than 20 min of actual work. They are also not easily changed in response to the continuously changing environment. To better serve customer needs there is a need to restore these processes to effectiveness, efficiency, and adaptability.

The Origins of PQM. IBM Corporation was among the first American companies to see the benefits of identifying and managing business processes. The spirit of IBM's first efforts in manag-

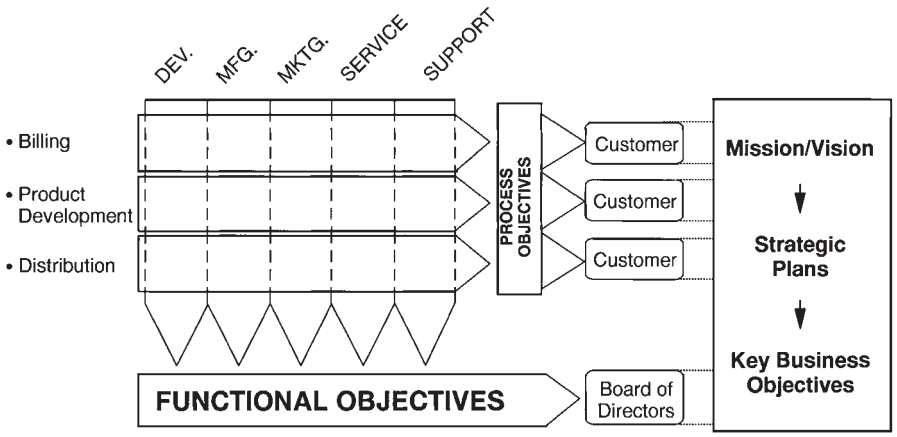

FIGURE 6.1 Workflow in a functional organization. (*Source: Juran Institute, Wilton, CT.*)

ing business processes in the early 1980s was expressed in the words of one executive: "Focus for improvement must be on the job process" (Kane 1986). Process Management has long been practiced in manufacturing. In product manufacturing, the plant manager "owns" a large part of the manufacturing process. This manager has complete responsibility for operating this part of the manufacturing process and is accountable for the results. As owner, the manager is expected to control, improve, and optimize the manufacturing process to meet customer needs and business needs (cost, cycle time, waste elimination, value creation, etc.). In pursuit of these targets, managers of the manufacturing process have developed some indispensable concepts and tools, including definition of process requirements, step-by-step process documentation, establishment of process measurements, removal of process defects, and assurance of process optimization. In fact, much of the science of industrial engineering is concerned with these tasks. Recognizing the value of these tools in manufacturing and their applicability to business processes, the IBM senior management committee directed that process management methodology be applied to all major business processes (such as product development, business planning, distribution, billing, market planning, etc.), and not just to the manufacturing process.

Around the same time, a number of other North American companies, including AT&T, Ford Motor Company, Motorola, Corning, and Hewlett-Packard, also began applying process management concepts to their business processes. In all of these companies, the emphasis was placed on cross-functional and cross-organizational processes. Application of process management methodology resulted in breaking down the functional barriers within the processes. In each case, a new, permanent managerial structure was established for the targeted process.

By mid-1985, many organizations and industries were managing selected major business processes with the same attention commonly devoted to functions, departments, and other organizational entities. Early efforts bore such names as Business Process Management, Continuous Process Improvement, and Business Process Quality Improvement.

Business Process Reengineering (BPR) should be mentioned as part of this family of methodologies. Like the methodologies mentioned previously in this section, BPR accomplishes a shift of managerial orientation from function to process. According to the consultants who first described BPR and gave it its name, BPR departs from the other methodologies in its emphasis on radical change of processes rather than on incremental change. Furthermore, BPR frequently seeks to change more than one process at the same time. Because of the economic climate of the early 1990s, and the outstanding payback that some writers attribute to BPR, its popularity grew rapidly for a time.

However, there is evidence, including the testimony of Michael Hammer, one of the most widely read writers on BPR, that in many early applications, the lure of rapid improvement caused some managers (and their consultants), who ignored human limitations, to impose too much change in too short a time, with a devastating effect on long-term organization performance. Furthermore, in many early applications, users became so fascinated by the promise of radical change that they changed everything, overlooking elements of the existing process design that worked perfectly well and would have been better carried over as part of the new design. Such a carryover would have saved time, reduced demand on the designers, and produced a better result.

Much has been published on process management. AT&T (1988), Black (1985), Gibson (1991–92), Hammer and Champy (1993), Kane (1986 and 1992), Pall (1987), Riley (1989), Rummler (1992), Schlesiona (1988), and Zachman (1990) have all proposed similar methodological approaches that differ from one another in minor details. The specific details of the methodology presented in this section were developed by consultants at the Juran Institute, Inc. [Gibson et al. (1990); Riley et al. (1994)], based on years of collective experience in a variety of industries.

Process Quality Management (PQM) Defined. The methodology described in this section is one which has been introduced with increasing success by a number of prominent corporations, including the ones already mentioned. While it may vary in name and details from company to company, the methodology possesses a core of common features which distinguishes it from other approaches to managing quality. That core of features includes: a conscious orientation toward customers and their needs; a specific focus on managing a few key cross-functional processes which most affect satisfaction of customer needs; a pattern of clear ownership—accountability for each key

process; a cross-functional team responsible for operating the process; application at the process level of quality-management processes—quality control, quality improvement, and quality planning. In this section, the methodology will be referred to as process quality management, or PQM.

AN APPLICATION EXAMPLE: THE CONTRACT MANAGEMENT PROCESS

Before discussing the details of PQM, an example will illustrate how a process, operating in a traditional functional hierarchy, may respond poorly to a seemingly minor change in an operating environment, and how the effects of that change can stimulate dramatic improvements, made possible by applying the process management approach. It also illustrates how the potential for dramatic improvement offered by a new technology (information technology, in this case) is more easily recognized when there is accountability for making those improvements.

In the early 1980s, a major multinational manufacturer of information processing systems decided to change its traditional rent-or-lease product pricing policy to include outright purchase. This strategic change led to a complete revision of the company's contracting policies, including terms and conditions. Instead of firm list prices, published discounts were now available; for especially large procurements, the company offered unpublished discounts with a number of financing options. A new contract management process evolved out of the new policy, an incremental modification of the existing process. The new process had to accommodate special contracts with a variety of nonstandard terms and conditions.

Within 2 years, more than 10 percent of the company's revenue was generated by "special contracts." However, as the percentage of this revenue increased, the ratio of sales closed to proposals made plummeted to fewer than 1 out of 5—a process yield of 20 percent. Both customers and field marketing representatives complained about the long turnaround time (the time elapsed from receipt of a request for a proposal until delivery of the proposal to the customer), which averaged 14 weeks. The process was simply unresponsive to customer business needs.

Facing lost business opportunities and a barrage of complaints from field marketing representatives, the executive quality council targeted this process for the application of process quality management. The director of contract management was designated as the process owner, and formed a process management team comprising representatives from field marketing, field administration, business systems, product development, finance, marketing practices, and legal services.

Originally, the contract management process was a serial set of steps (Figure 6.2). The process started with the field marketing representative, who received a request for a special contract proposal from the customer. A draft of the contract proposal was then prepared in the branch office with the help of branch administration and reviewed by the branch manager. Subsequently, it was submitted for regional management review (usually in another geographic location) and finally for a comprehensive evaluation at headquarters by large-account marketing, marketing practices, finance, and business systems. If the proposal was in order, a contract was prepared. The contract management department then arranged for up to 28 sequential approvals of the contract at the executive level, involving various functions, such as product development, finance, legal services, and the like.

Having successfully passed all these hurdles, the contract was then approved and returned to marketing division headquarters for further refinement and processing. Eventually, some 3 to 4 months later, the proposed contract returned to the branch office for presentation to the customer. In many instances, it arrived too late. The customer had taken the business to a competitor.

The process management team flow-charted the process, and validated a number of hypotheses. These included: manual processing was slow; there were postal service delays; the serial approval process, consisting of up to 28 high-level executive signoffs, took too long; the memo-generated guidelines for the format and content of the contract proposal were vague, conflicting, and difficult to access; and there was substantial resistance to changing to the new, purchase-only strategy, especially by the finance, business practices, and legal functions.

Branch Office	Regional Office	HQ Large-Account Marketing	HQ Special-Contract Management	Assorted High-Level Managers
Prepare special-contract proposal→	Review, approve, forward→	Log in, review, and assign for approval→	Review, provide price, terms, and conditions; schedule approvals→	28 sequential approvals ↓
Plan presentation			← Consolidate changes and approvals; finalize special contract	←

FIGURE 6.2 Special-contract management process (before application of process-management principles). (*Source: Juran Institute, Wilton, CT.*)

After several months of process redesign and test, the team launched the new contract management process, shown in Figure 6.3. The new process addressed all causes of delay that the team had discovered. It made especially good use of new information technology support, which was unavailable years before when the contract management process began operation.

In designing the new process, the team incorporated a number of important new features:

- The team wrote new guidelines for contract proposal preparation and installed them on-line, using a national electronic mail system. They established a system to keep the guidelines continuously updated. This measure accelerated both preparation and transmission of contract proposals.
- They arranged for approval authority for simple contracts—those of lower dollar volume or having no special engineering requirements—to be delegated to the regional marketing manager.
- They established two review boards for concurrent review and approval of special contracts. The concurrent processes replaced the serial process.
- They found that the teamwork required by the cross-functional arrangement had the added effect of reducing interfunctional rivalry and resistance to the new marketing policy.
- They established turnaround time requirements for each activity in the process, then measured and tracked actual performance against the standards. Whenever they experienced delays beyond the specified time targets, they initiated corrective action. For example, each review board had 5 business days to review proposals, approve them, and pass them on. With the target established, it was a relatively simple matter for the board to monitor its own performance against the standard.

This new management approach resulted in an 83 percent improvement in average turnaround time (from 14 weeks to 17 days), and an increase in process yield of 180 percent (from 20 to 56 percent). Still, the team was not satisfied. They implemented two more process redesigns in the next 3 years. After 5 years of PQM focus, the special-contract management process was performing at a 60 percent yield. For simple contracts, which account for 92 percent of the process volume, the turnaround time is 24 hours.

Before it was redesigned, this process consumed the equivalent of 117 full-time people; as of 1995, after the several redesigns, it required fewer than 60. Special-contract revenue now exceeds 30

Branch Office	Regional Office	HQ Large-Account Marketing	HQ Special-Contract Management	Assorted High-Level Managers	Review Board #1	Review Board #2
Prepare special-contract proposal→	Review, approve→		Screen, log in, and follow review board actions→	[Sequential approvals eliminated]→	Evaluate and approve→	Evaluate and approve ↓
Plan presentation			← Finalize special contract			←

FIGURE 6.3 Special-contract management process (after application of process-management principles). (*Source: Juran Institute, Wilton, CT.*)

percent of total U.S. revenue—an all-time high. Customers and company management agree that the present process performance may be judged effective and efficient. As additional redesigns are required to respond to the inevitable changes in environment, the managers believe that the process will also prove to be adaptable.

THE PQM METHODOLOGY

Overview. A PQM effort is initiated when executive management selects key processes, identifies owners and teams, and provides them with process mission statements and goals. After the owners and team are trained in process methodology, they work through the three phases of PQM methodology: planning, transfer, and operational management.

The *planning phase,* in which the process design (or redesign) takes place, involves five steps:

1. Defining the present process.
2. Determining customer needs and process flow.
3. Establishing process measurements.
4. Conducting analyses of measurement and other data.
5. Designing the new process. The output is the new process plan.

Planning is the most time-consuming of the three phases.

The *transfer phase* is the second phase, in which the plans developed in the first phase are handed off from the process team to the operating forces and put into operation.

Operational management is the third phase of PQM. Here, the working owner and team first monitor new process performance, focusing on process effectiveness and efficiency measurements. They apply quality control techniques, as appropriate, to maintain process performance. They use quality improvement techniques to rid the process of chronic deficiencies. Finally, they conduct a periodic executive management review and assessment to ensure that the process continues to meet customer needs and business needs, and remains competitive.

Replanning, the cycling back to the first phase, is invoked when indicated. PQM is not a one-time event; it is itself a continuous process.

Initiating PQM Activity

Selecting the Key Process(es). Organizations operate dozens of major cross-functional business processes. From these a few key processes are selected as the PQM focus. The organization's Strategic Plan provides guidance in the selection of the key processes. (See Section 13, Strategic Deployment.)

There are several approaches to selecting key business processes:

- The Critical Success Factor approach holds that for any organization relatively few (no more than eight) factors can be identified as "necessary and sufficient" for the attainment of its mission and vision. Once identified, these factors are used to select the key business processes and rank them by priority (Hardaker and Ward 1987).
- The Balanced Business Scorecard (Kaplan and Norton 1992) measures business performance in four dimensions: financial performance, performance in the eyes of the customer, internal process performance, and performance in organization learning and innovation. For each dimension, performance measures are created and performance targets are set. Using these measures to track performance provides a "balanced" assessment of business performance. The processes which create imbalances in the scorecard are identified as the processes that most need attention—the key processes.
- Another approach is to invite upper management to identify a few (four to six) organization-specific critical selection criteria to use in evaluating the processes. Examples of such criteria are:

effect on business success, effect on customer satisfaction, significance of problems associated with the process, amount of resources currently committed to the process, potential for improvement, affordability of adopting process management, and effect of process on schedule. Using the criteria and some simple scoring system (such as "low, medium, or high"), the managers evaluate the many processes from the long list of the organization's major business processes (10 to 25 of them) and, by comparing the evaluations, identify the key processes. (The long list may be prepared in advance in a process identification study conducted separately, often by the chief quality officer, and often with the support of a consultant.

Whatever approach is used to identify key processes, the process map can be used to display the results. The "process map" is a graphic tool for describing an organization in terms of its business processes and their relationships to the organization's principal stakeholders. The traditional organization chart answers the question: "Who reports to whom?" The process map answers the question: "How does the organization's work get done?"

Figure 6.4 describes the work of the Educational Testing Service (ETS), the organization that prepares and administers educational entrance examinations in the United States. In this process map, organizations and departments are represented by shaded blocks labeled in bold type. The key operational units of ETS, including external units designated "partners" by ETS, are located within a boundary line labeled "ETS." The important business processes of ETS are listed within that boundary and marked by an asterisk (*). These are the processes eligible for the PQM focus, shown in their relationship to various parts of the organization. Picturing the organization from a process perspective provides upper management with a useful tool in thinking about and discussing the organization in terms of its work and the processes it employs to get the work done.

Organizing: Assigning Ownership, Selecting the Team, and PQM Infrastructure. Because certain major cross-functional business processes, the *key processes,* are critical to business success, the

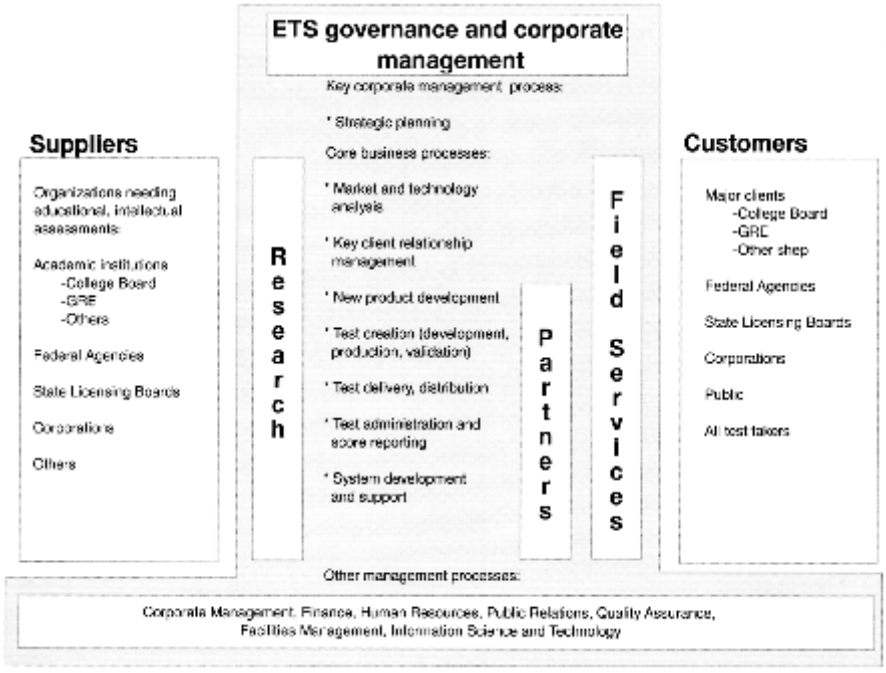

FIGURE 6.4 Process map of major business processes at Educational Testing Services. (*Source: Juran Institute, Wilton, CT.*)

quality council sees to it that those processes are organized in a special way. After selecting key processes, the quality council appoints a process owner, who is responsible for making the process effective, efficient, and adaptable, and is accountable for its performance (Riley, 1989 and 1994).

For large complex processes, especially in large companies, a two-tier ownership arrangement is most often used. An appointed executive owner operates as a sponsor, champion, and supporter at the upper management level, and is accountable for process results. At the operating level, a working owner, usually a first- or second-level manager, leads the process-management team responsible for day-to-day operation. The owner assignments—executive owner and working owner—are ongoing. The major advantages of this structure are that there is at the same time "hands on" involvement and support of upper management and adequate management of the process details.

The process-management team is a peer-level group which includes a manager or supervisor from each major function within the process. Each member is an expert in a segment of the process. Ideally, process management teams have no more than eight members, and the individuals chosen should be proven leaders. The team is responsible for the management and continuous improvement of the process. The team shares with the owner the responsibilities for effectiveness and efficiency. Most commonly, the team assignments are ongoing.

From time to time a process owner creates an ad hoc team to address some special issue (human resources, information technology, activity-based costing, etc.). The mission of such a project-oriented team is limited, and the team disbands when the mission is complete. The ad hoc team is different from the process-management team.

Figure 6.5 is a simplified diagram of a multifunctional organization and one of its major processes. The shaded portions include: the executive owner, the working owner, the process management team, and the stakeholders—functional heads at the executive level who have work activities of the business process operating within their function. Customarily, the stakeholders are members of the quality council, along with the executive owner. Taken together, this shaded portion is referred to as the PQM Infrastructure.

Establishing the Team's Mission and Goals. The preliminary process mission and improvement goals for the process are communicated to the owners (executive and working levels) and team by the quality council. To do their jobs most effectively, the owners and team must make the mission and goals their own. They do this in the first step of the planning phase: defining the process.

The Planning Phase: Planning the New Process. The first phase of PQM is Planning, which consists of five steps: (1) defining the process, (2) discovering customer needs and flow-

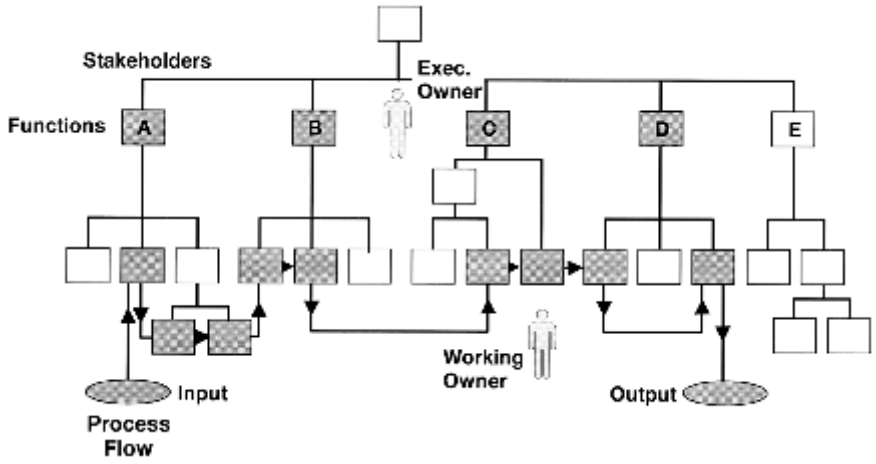

FIGURE 6.5 Organization infrastructure for process management in multifunctional organizations. (*Source: Juran Institute, Wilton, CT.*)

charting the process, (3) establishing measurements of the process, (4) analyzing process measurements and other data, and (5) designing (or redesigning) the process. The output of the Planning Phase is the new process plan.

Defining the Current Process. The owner(s) and team collaborate to define the process precisely. In accomplishing this, their starting point and principal reference is the process documentation developed by the quality council during the selection of key processes and identification of owners and teams. This documentation includes preliminary statements of mission and goals.

Effective mission and goal statements explicitly declare:

- The purpose and scope of the process
- "Stretch" targets for customer needs and business needs

(The purpose of the stretch target is to motivate aggressive process improvement activity.)

As an example, a mission statement for the Special-Contract Management Process is: Provide competitive special pricing and supportive terms and conditions for large information systems procurements that meet customer needs for value, contractual support, and timeliness at affordable cost.

The goals for the same process are:

1. Deliver approved price and contract support document within 30 days of date of customer's letter of intent.
2. Achieve a yield of special-contract proposals (percent of proposals closed as sales) of not less than 50 percent.

The team must reach consensus on the suitability of these statements, propose modifications for the quality council's approval, if necessary, and also document the scope, objectives, and content. Based on available data and collective team experience, the team will document process flow, the process strengths and weaknesses, performance history, measures, costs, complaints, environment, resources, and so on. This will probably involve narrative documentation and will certainly require the use of flow diagrams.

Bounding the business process starts with an inventory of the major subprocesses—six to eight of them is typical—that the business process comprises. The inventory must include the "starts-with" subprocess (the first subprocess executed), the "ends-with" subprocess (the last executed), and the major subprocesses in between. If they have significant effect on the quality of the process output, activities upstream of the process are included within the process boundary. To provide focus and avoid ambiguity, it is also helpful to list subprocesses which are explicitly excluded from the business process. The accumulating information on the process components is represented in diagram form, which evolves, as the steps of the planning phase are completed, from a collection of subprocesses to a flow diagram.

Figure 6.6 shows the high-level diagram of the special-contract process that resulted from process analysis but before the process was redesigned. At the end of the process definition step such a diagram is not yet a flow diagram, as there is no indication of the sequence in which the subprocesses occur. Establishing those relationships as they presently exist is the work of Step 2.

Discovering Customer Needs and Flowcharting the Process. For the process to do its work well, the team must identify all of the customers, determine their needs, and prioritize the information. Priorities enable the team to focus its attention and spend its energies where they will be most effective. (The subject of identifying customers and their needs is covered in detail in Section 3, The Quality Planning Process.)

Determining customer needs and expectations requires ongoing, disciplined activity. Process owners must ensure that this activity is incorporated in the day-to-day conduct of the business process as the customer requirements subprocess and assign accountability for its performance. The output of this vital activity is a continually updated customer requirement statement.

On the process flow chart it is usual to indicate the key suppliers and customers and their roles in the process, as providers or receivers of materials, product, information, and the like. Although the

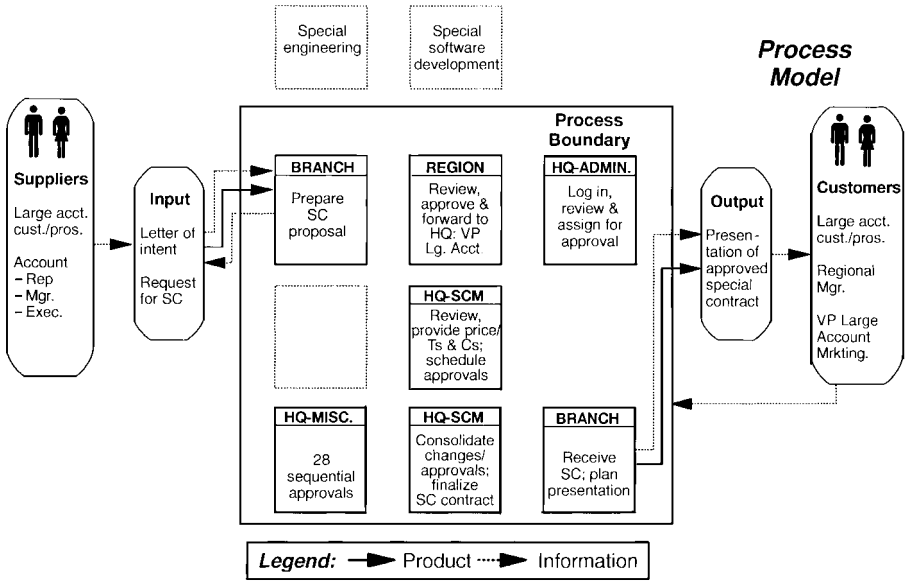

FIGURE 6.6 High-level diagram of the special-contract process, an output of process analysis. (*Source: Juran Institute, Wilton, CT.*)

diagram can serve a number of specialized purposes, the most important here is to create a common, high-level understanding among the owner and team members of how the process works—how the subprocesses relate to each other and to the customers and suppliers and how information and product move around and through the process. In creating the process flow chart, the team will also verify the list of customers and may, as understanding of the process deepens, add to the list of customers.

The process flow chart is the team's primary tool for analyzing the process to determine whether it can satisfy customer needs. By walking through the chart together, step by step, sharing questions and collective experience, the team determines whether the process is correctly represented, making adjustments to the diagram as necessary to reflect the process as it presently operates.

When the step is complete, the team has a starting point for analysis and improvement of the process. In Figure 6.8, product flow is shown by solid lines and information flow by dotted lines.

Establishing Process Measurements. What gets measured, gets done. Establishing, collecting, and using the correct measures is critical in managing business process quality. "Process capability," "process performance," and other process measures have no practical significance if the process they purport to describe is not managed. To be managed, the process must fulfill certain minimum conditions:

a. It has an owner.

b. It is defined.

c. Its management infrastructure is in place.

d. Its requirements are established.

e. Its measurements and control points are established.

f. It demonstrates stable, predictable, and repeatable performance.

A process which fulfills these minimum conditions is said to be *manageable.* Manageability is the precondition for all further work in PQM.

Of these criteria, (a) through (d) have already been addressed in this section. Criteria (e) and (f) are addressed in the following.

Process Measurements (See also Section 9). In deciding what aspects of the process to measure, we look for guidance to the process mission and to our list of customer needs. Process measures based on customer needs provide a way of measuring process effectiveness. For example, if the customer requires delivery of an order within 24 hours of order placement, we incorporate into our order-fulfillment process a measure such as "time elapsed between receipt of order and delivery of order," and a system for collecting, processing, summarizing, and reporting information from the data generated. The statistic reported to the executive owner will be one such as "percent of orders delivered within 24 hours," a statistic which summarizes on-time performance. The team will also need data on which to base analysis and correction of problems and continuous improvement of the process. For this purpose, the team needs data from which they can compute such descriptive statistics as distribution of delivery times by product type, and so on. The uses to which the data will be put must be thought through carefully at the time of process design to minimize the redesign of the measures and measurement systems.

Process measures based on cost, cycle time, labor productivity, process yield, and the like are measures of process efficiency. Suppose that a goal for our order-fulfillment process is to reduce order-picking errors to one error per thousand order lines. Managing to that goal requires identification of order-picking errors in relation to the number of order lines picked. For order-picking errors that are inadvertent—that is, when they happen, the picker is unaware of them—measuring them requires a separate inspection to identify errors. In a random audit on a sample of picked orders, an inspector identifies errors and records them. As with delivery-time measurement, the team must think through all the uses it will make of these measurements. For a report of estimated error rate, the data needed are: number of errors and number of order lines inspected. To improve process performance in this category, the data must help the team identify error sources and determine root cause. For that to occur, each error must be associated with time of day, shift, product type, size of package, etc., so that the data can be stratified to test various theories of root cause.

While not a measurement category, process adaptability is an important consideration for process owners and teams. Adaptability will be discussed later in this section.

Process measurements must be linked to business performance. If certain key processes must run exceptionally well to ensure organization success, it follows that collective success of the key processes is good for the organization's performance. Process owners must take care to select process measures that are strongly correlated with traditional business indicators, such as revenue, profit, ROI, earnings per share, productivity per employee, and so on. In high-level business plan reviews, managers are motivated and rewarded for maintaining this linkage between process and organization performance measures because of the two values which PQM supports: organization success is good, and process management is the way we will achieve organization success.

Figure 6.7 shows some typical process measurements and the traditional business indicators with which they are linked. To illustrate, "percent of sales quota achieved" is a traditional business indicator relating to the business objective of improving revenue. The special-contract management process has a major impact on the indicator, since more than 30 percent of U.S. revenue comes from that process. Therefore, the contract close rate (ratio of the value of firm contracts to the total value of proposals submitted) of the special-contract management process is linked to percent of sales quota and other traditional revenue measures, and is therefore a measure of great importance to management. Measurement points appear on the process flow diagram.

Control Points. Process measurement is also a part of the control mechanisms established to maintain planned performance in the new process. To control the process requires that each of a few selected process variables be the control subjects of a feedback control loop. Typically, there will be five to six control points at the macroprocess level for variables associated with: external output, external input, key intermediate products, and other high-leverage process points.

The control points in the special-contract management process are represented graphically in Figure 6.8. Feedback loop design and other issues surrounding process control are covered in detail in Section 4, The Quality Control Process.

The Traditional Business View		The Process View	
Business Objective	Business Indicator	Key Process	Process Measure
Higher revenue	Percent of sales quota achieved	Contract management	Contract close rate
	Percent of revenue plan achieved	Product development	Development cycle time
	Value of orders canceled after shipment	Account management	Backlog management and system assurance timeliness
	Receivable days outstanding		Billing quality index
Reduce costs	Inventory turns	Manufacturing	Manufacturing cycle time

FIGURE 6.7 Linkages among business objectives, traditional business indicators, and process measures generated by the process-management approach—a few examples. (*Source: Juran Institute, Wilton, CT.*)

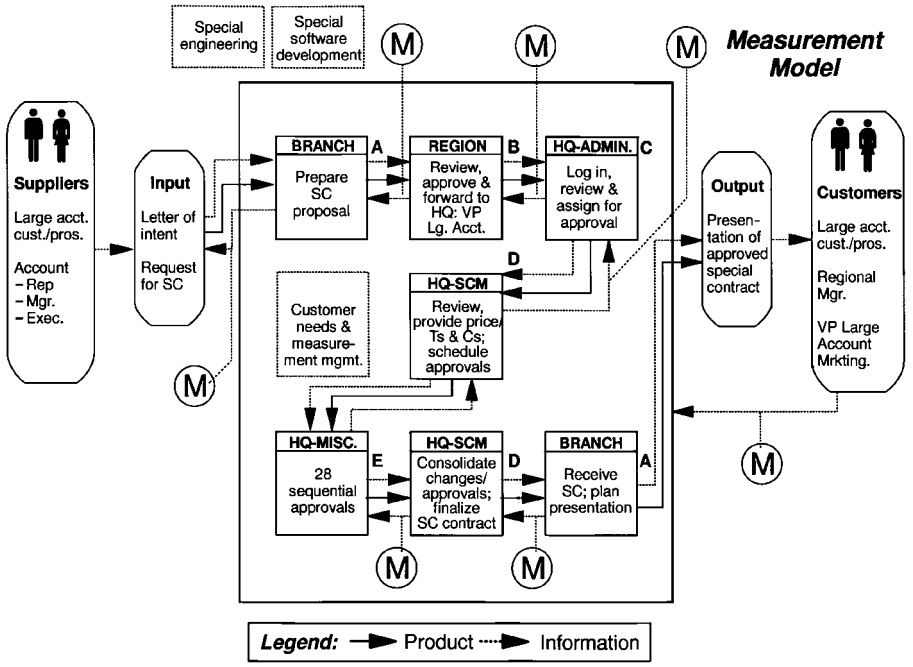

FIGURE 6.8 Flowchart of the special-contract management process, including process control points. (*Source: Juran Institute, Wilton, CT.*)

Process Variability, Stability, and Capability. As in all processes, business processes exhibit variability. The tools of statistical process control such as Shewhart charts (see Section 45, Statistical Process Control) help the team to minimize process variation and assess process stability.

Evaluation of process capability is an important step in process quality improvement. Process capability is a measure of variation in a process operating under stable conditions. "Under stable conditions" means that all variation in the process is attributable to random causes. The usual criterion for stability is that the process, as plotted and interpreted on a Shewhart control chart, is "in control."

Statistical process control, process capability, and associated tools are useful components of the process team's tool kit. They are covered in detail in Section 44, Basic Statistical Methods.

The output of the measurement step is a measurement plan, a list of process measurements to be made and the details of making each one—who will make it, how it will be made, on what schedule, and so on.

Analyzing the Process. Process Analysis is performed for the following purposes:

- Assess the current process for its effectiveness and efficiency.
- Identify the underlying causes of any performance inadequacy.
- Identify opportunities for improvement.
- Make the improvements.

First, referring to the process flowchart, the team breaks the process into its component activities using a procedure called "process decomposition," which consists of progressively breaking apart the process, level by level, starting with the macrolevel. As decomposition proceeds, the process is described in ever finer detail.

As the strengths and weaknesses of the process are understood at one level, the process management team's interim theories and conclusions will help decide where to go next with the analysis. The team will discover that certain subprocesses have more influence on the performance of the overall business process than others (an example of the Pareto principle). These more significant subprocesses become the target for the next level of analysis.

Decomposition is complete when the process parts are small enough to judge as to their effectiveness and efficiency. Figure 6.9 gives examples from three levels of decomposition (subprocess, activity, and task) of three typical business processes (procurement, development engineering, and office administration).

Measurement data are collected according to the measurement plan to determine process effectiveness and efficiency. The data are analyzed for effectiveness (conformance to customer needs) and long-term capability to meet current and future customer requirements.

The goal for process efficiency is that all key business processes operate at minimum total process cost and cycle time, while still meeting customer requirements.

Process *effectiveness* and *efficiency* are analyzed concurrently. Maximizing effectiveness and efficiency together means that the process produces high quality at low cost; in other words, it can provide the most *value* to the customer.

"Business process adaptability" is the ability of a process to readily accommodate changes both in the requirements and the environment, while maintaining its effectiveness and efficiency over time.

To analyze the business process, the flow diagram is examined in four steps and modified as necessary. The steps are:

- Examine each decision symbol

  Is this a checking activity?

Business Process	Subprocess	Activity	Task
Procurement	Vendor selection	Vendor survey	Documentation of outside vendor
Development engineering	Hardware design	Engineering change	Convening the Change Board
Office administration	Providing secretarial services	Calendar management	Making a change to existing calendar

FIGURE 6.9 Process decomposition—examples of process elements disclosed within typical business processes. (*Source: Juran Institute, Wilton, CT.*)

If so, is this a complete check, or do some types of errors go undetected?

Is this a redundant check?

- Examine each rework loop

  Would we need to perform these activities if we had no failures?

  How "long" is this rework loop (as measured in number of steps, time lost, resources consumed, etc.)?

  Does this rework loop prevent the problem from recurring?

- Examine each activity symbol

  Is this a redundant activity?

  What is the value of this activity relative to its cost?

  How have we prevented errors in this activity?

- Examine each document and database symbol

  Is this necessary?

  How is this kept up to date?

  Is there a single source for this information?

  How can we use this information to monitor and improve the process?

The "Process Analysis Summary Report" is the culmination and key output of this process analysis step. It includes the findings from the analysis, that is, the reasons for inadequate process performance and potential solutions that have been proposed and recorded by owner and team as analysis progressed. The completion of this report is an opportune time for an executive owner/stakeholder review.

The owner/stakeholder reviews can be highly motivational to owners, teams, stakeholders, and the Quality Council. Of particular interest is the presentation of potential solutions for improved process operation. These have been collected throughout the planning phase and stored in an idea bin. These design suggestions are now documented and organized for executive review as part of the process analysis summary report presentation.

In reviewing the potential solutions, the executive owner and quality council provide the selection criteria for acceptable process design alternatives. Knowing upper management's criteria for proposed solutions helps to focus the process-management team's design efforts and makes a favorable reception for the reengineered new process plan more likely.

Designing (or Redesigning) the Process. In Process Design, the team defines the specific operational means for meeting stated product goals. The result is a newly developed Process Plan. Design changes fall into five broad categories: workflow, technology, people and organization, physical infrastructure, and policy and regulations.

In the design step, the owner and team must decide whether to create a new process design or to redesign the existing process. Creating a new design might mean radical change; redesign generally means incremental change with some carryover of existing design features.

The team will generate many design alternatives, with input from both internal and external sources. One approach to generating these design alternatives from internal sources is to train task-level performers to apply creative thinking to the redesign of their process.

Ideas generated in these sessions are documented and added to the idea bin. Benchmarking can provide a rich source of ideas from external sources, including ideas for radical change. Benchmarking is discussed in detail in Section 12.

In designing for process effectiveness, the variable of most interest is usually process cycle time. In service-oriented competition, lowest process cycle time is often the decisive feature. Furthermore, cycle-time reduction usually translates to efficiency gains as well. For many processes, the most promising source of cycle-time reduction is the introduction of new technology, especially information technology.

Designing for speed creates surprising competitive benefits: growth of market share and reduction of inventory requirements. Hewlett-Packard, Brunswick Corp., GE's Electrical Distribution and Control Division, AT&T, and Benetton are among the companies who have reported stunning achievements in cycle-time reduction for both product development and manufacturing (Dumaine, 1989). In each of the companies, the gains resulted from efforts based on a focus on major processes. Other common features of these efforts included:

- Stretch objectives proposed by top management
- Absolute adherence to schedule, once agreed to
- Application of state-of-the art information technology
- Reduction of management levels in favor of empowered employees and self-directed work teams
- Putting speed in the culture

In designing for speed, successful redesigns frequently originate from a few relatively simple guidelines: eliminate handoffs in the process, eliminate problems caused upstream of activity, remove delays or errors during handoffs between functional areas, and combine steps that span businesses or functions. A few illustrations are provided:

- *Eliminate handoffs in the process:* A "handoff" is a transfer of material or information from one person to another, especially across departmental boundaries. In any process involving more than a single person, handoffs are inevitable. It must be recognized, however, that the handoff is time-consuming and full of peril for process integrity—the missed instruction, the confused part identification, the obsolete specification, the miscommunicated customer request.

  In the special-contract management process, discussed previously in this section, the use of concurrent review boards eliminated the 28 sequential executive approvals and associated handoffs.
- *Eliminate problems caused upstream of activity.* Errors in order entry at a U.S. computer company were caused when sales representatives incorrectly configured systems. As a result, the cost of the sales-and-order process was 30 percent higher than that of competitors, and the error rates for some products were as high as 100 percent. The cross-functional redesign fixed both the configurations problem and sales-force skills so that on-time delivery improved at significant cost savings (Hall, Rosenthal, and Wade 1993).
- *Remove delays or errors during handoffs between functional areas:* The processing of a new policy at a U.K. insurance company involved 10 handoffs and took at least 40 days to complete. The company implemented a case-manager approach by which only one handoff occurred and the policy was processed in less than 7 days (Hall, Rosenthal, and Wade 1993).
- *Combine steps that span businesses or functions:* At a U.S. electronics equipment manufacturer, as many as seven job titles in three different functions were involved in the nine steps required to design, produce, install, and maintain hardware. The company eliminated all but two job titles, leaving one job in sales and one job in manufacturing (Hall, Rosenthal, and Wade 1993).

The Ford accounts payable process provides a classic example of process redesign. Details are given by Hammer and Champy (1993). Process Quality Management is successful when the design step involved radical change. Hammer and Champy propose the following principles for such radical change of a process:

- Organize the process around outcomes, not tasks.
- Have those who use the output of the process perform the process.
- Incorporate information-processing work into the real work that produces the information.
- Treat geographically dispersed resources as though they were centralized.
- Coordinate parallel functions within the process, not in subsequent steps.
- Put the decision point where the work is performed and build control into the process.
- Capture information only once and at the source.

Before the new design is put into place, a design review is in order. Its purpose is to temper the enthusiasm of the team with the objectivity of experienced outsiders. Typically, the process owner assembles a panel of experts from within the organization (but outside the process) to provide the evaluation of design alternatives.

Process design testing is performed to determine whether the process design alternative will work under operating conditions. Design testing may include trials, pilots, dry runs, simulations, etc. The results are used to predict new process performance and cost/benefit feasibility.

Successful process design requires employee participation and involvement. To overlook such participation creates a lost opportunity and a barrier to significant improvement. The creativity of the first-line work force in generating new designs can be significant.

Byrne (1993) reports that many companies are adopting "horizontal organizational design," which features the use of self-directed work teams organized around the process. Eastman Chemical has over 1000 teams; increasing reliance on self-directed teams has enabled the company to eliminate senior VP positions for administration, manufacturing, and R&D. (See also Section 15, Human Resources and Quality.)

Lexmark International, a former IBM division, abolished 60 percent of the management jobs in manufacturing and support services. Instead, they organized around cross-functional teams worldwide.

Creating the New Process Plan. After we have redefined a key process, we must document the new process and carefully explain the new steps. The new process plan now includes the new process design and its control plan for maintaining the new level of process performance. The new process plan for the special-contract management process, shown as a high-level process schematic, is shown in Figure 6.10.

The Transfer Phase: Transferring the New Process Plan to Operations. The transfer phase consists of three steps: (1) planning for implementation problems, (2) planning for implementation action, and (3) deploying the new process plan.

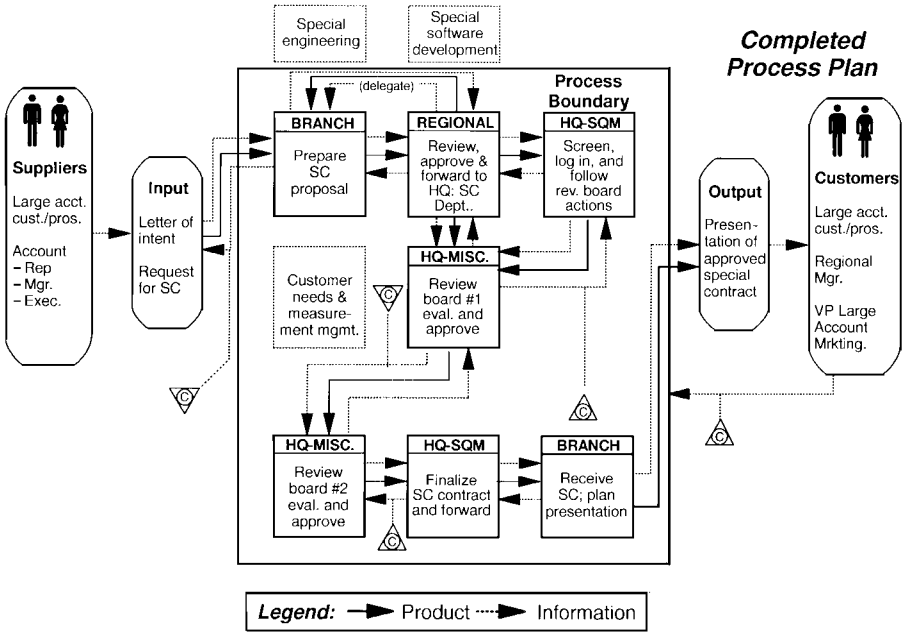

FIGURE 6.10 Completed process plan diagram for the special-contract management process. (*Source: Juran Institute, Wilton, CT.*)

Planning for Implementation Problems. A major PQM effort may involve huge expenditures and precipitate fundamental change in an organization, affecting thousands of jobs. All of this poses major management challenges. All of the many changes must be planned, scheduled, and completed so that the new process may be deployed to operational management. Figure 6.11 identifies specific categories of problems to be addressed and the key elements that are included.

Of the five categories listed in Figure 6.11, People and Organization is usually the source of the most challenging change issues in any PQM effort. Implementation issues in the people and organizational design category include: new jobs, which are usually bigger; new job descriptions; training people in the new jobs; new performance plans and objectives; new compensation systems (incentive pay, gainsharing, and the like); new recognition and reward mechanisms; new labor contracts with unions; introduction of teamwork and team-building concepts essential to a process orientation; formation of self-directed work teams; team education; reduction of management layers; new reporting relationships; development and management of severance plans for those whose jobs are eliminated; temporary continuation of benefits; out-placement programs; and new career paths based on knowledge and contribution, rather than on promotion within a hierarchy. The list goes on. Additionally, there are changes in technology, policy, physical infrastructure, etc., to be dealt with.

The importance of change management skills becomes clear. Deploying a new process can be a threat to those affected. The owner and team must be skilled in overcoming resistance to change.

Creating Readiness for Change: A Model for Change. Change happens when four conditions are combined. First, the current state must be seen as unsatisfactory, even painful; it must constitute a tension for change. Second, there must be a satisfactory alternative, a vision of how things can be better. Third, some practical steps must be available to reach the satisfactory state, including instruction in how to take the steps, and support during the journey. Fourth, to maintain the change, the organization and individuals must acquire skills and reach a state of self-efficacy.

These four conditions reinforce the intent to change. Progress toward that change must be monitored continuously so as to make the change a permanent one. In the operational management phase, operational controls, continuous improvement activity, and ongoing review and assessment all contribute to ensuring that the new process plan will continue to perform as planned. (See also Resistance to Change and how to deal with it in Section 5, The Quality Improvement Process.)

Planning for Implementation Action. The output of this step is a complex work plan, to be carried out by the Owner and Process Management Team. They will benefit from skills in the techniques of Project Management. (See Section 17, Project Management and Product Development.)

Deploying the New Process Plan. Before actually implementing the new process, the team tests the process plan. They test selected components of the process and may carry out computer simulations. The purpose is to predict the performance of the new process and determine feasibility. Also, the tests help the team refine the "roll out" of the process and decide whether to conduct parallel

Category	Key Elements Included
Workflow	Process anatomy (macro/micro, cross-functional, intrafunctional, interdepartmental, and intradepartmental)
Technology	Information technology and automation
People and organization	Jobs, job description, training and development, performance management, compensation (incentive-based or not), recognition/reward, union involvement, teams, self-directed work teams, reporting relationships and delayering
Infrastructure (physical)	Location, space, layout, equipment, tools, and furnishings
Policy/regulations	Government, community, industry, company, standards, and culture
New-process design issues	

FIGURE 6.11 Design categories. (*Source: Juran Institute, Wilton, CT.*)

operation (old process and new process running concurrently). The team must decide how to deploy the new process. There are several options:

- *Horizontal deployment,* function by function.
- *Vertical deployment,* top down, all functions at once.
- *Modularized deployment,* activity by activity, until all are deployed.
- *Priority deployment,* subprocesses and activities in priority sequence, those having the highest potential for improvement going first.
- *Trial deployment,* a small-scale pilot of the entire process, then expansion for complete implementation. This technique was used in the first redesign of the Special-Contract Management process, that is, a regional trial preceded national expansion. The insurance company USAA conducts all pilot tests of new process designs in their Great Lakes region. In addition to "working the bugs out of the new design before going national," USAA uses this approach as a "career-broadening experience for promising managers," and to "roll out the new design to the rest of the organization with much less resistance" (Garvin 1995).

Full deployment of the new process includes the development and deployment of an updated control plan. Figure 6.12 lists the contents of a new process plan.

Operational Management Phase: Managing the New Process. The Operational Management Phase begins when the process is put into operation. The major activities in operational management are: (1) process quality control, (2) process quality improvement, and (3) periodic process review and assessment.

Process Quality Control. "Process control" is an ongoing managerial process, in which the actual performance of the operating process is evaluated by measurements taken at the control points, comparing the measurements to the quality targets, and taking action on the difference. The goal of process control is to maintain performance of the business process at its planned level. (See Section 4, The Quality Control Process).

Process Quality Improvement. By monitoring process performance with respect to customer requirements, the process owner can identify gaps between what the process is delivering and what is required for full customer satisfaction. These gaps are targets for process quality improvement

- Process mission
- Process goals
- Process management infrastructure (that is, owner/team/stakeholders)
- Process contract
- Process description/model
- Customer requirements (that is, customer list, customer needs, and requirements statement)
- Process flow
- Measurement plan
- Process analysis summary report
- Control plan
- Implementation action plan
- Resource plan
- Schedules/timeline

FIGURE 6.12 Contents of complete process plan (*Source: Juran Institute, Wilton, CT.*)