Some would argue that processes underlie all information systems. After all, technology links and supports all organizational activities in this information age. Directions and game plans for dealing with this area make implementation of information systems easier for managers.

—Alistar Davidson et al. [1997]

**SETTING THE STAGE**

The first case study is built on a real one that involves a company that is seeking to improve productivity via an aggressive process improvement program. I have been working with firms for over a decade. As the case unfolds, I use this firm to illustrate how to build similar business cases from situations that occur. The reason I selected the chapter title “Playing the Game of Dungeons and Dragons” is to show how unexpected events may influence how you justify your process improvement initiatives. My goal is help you to put the fundamental concepts that we covered in the first four chapters into practice using the case study, the game.

You are probably asking by now, “What’s the object of the game, who are the players, and what are the rules?” Of course, the goal is to win the game. Winning
requires you to formulate a game plan and get management to fund the investments required to pull it off. The business case provides management with the motivation they need to support you. The players include senior management, program management, the quality assurance group, the process group, and the performer organizations. These groups are organized via matrix management concepts as illustrated in Figure 5.1 [Daly, 1997]. Senior management champions the process cause and provides encouragement and support for the effort. Program management focuses on delivering acceptable products on schedule and budget. Performer organizations provide the technical talent to get the work done. The process group develops the organizational processes and helps projects tailor them for their use. Finally, quality assurance audits to ensure that projects use the approved processes. More details on these organizational roles and responsibilities are provided in Table 5.1. In my experience, these roles are standard across industries.

The organization’s history of process improvement is displayed in Figure 5.2. As the figure illustrates, it began its process improvement programs

![Organizational Structure Diagram]

Figure 5.1: Organizational Structure
**Table 5.1: Organizational Roles and Responsibilities**

<table>
<thead>
<tr>
<th>Group</th>
<th>General Role</th>
<th>Process Improvement Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior management</td>
<td>Provide corporate vision and leadership. Provide oversight and direction.</td>
<td>Champion the overall process</td>
</tr>
<tr>
<td></td>
<td></td>
<td>improvement initiative.</td>
</tr>
<tr>
<td>Program management</td>
<td>Manage the timely delivery of quality products that satisfy customer</td>
<td>Sponsor process and stress its</td>
</tr>
<tr>
<td></td>
<td>requirements per agreed-to budgets and schedules.</td>
<td>importance.</td>
</tr>
<tr>
<td></td>
<td>Maintain customer liaison.</td>
<td>Ensure that adopted process</td>
</tr>
<tr>
<td></td>
<td></td>
<td>initiatives make both technical and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>business sense.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provide the budget needed to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tailor and use the process at the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>program and/or project level.</td>
</tr>
<tr>
<td>Process group</td>
<td>Develop institutional processes and stimulate their adoption organization-</td>
<td>Develop and roll out processes</td>
</tr>
<tr>
<td></td>
<td>wide.</td>
<td>at the institutional level.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Train performers in the use of the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>processes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Support performers as they try to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>use the processes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Optimize the processes and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>implement statistical process</td>
</tr>
<tr>
<td></td>
<td></td>
<td>controls.</td>
</tr>
<tr>
<td>Quality assurance group</td>
<td>Ensure that performers follow approved processes.</td>
<td>Monitor the use of the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>process.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If the process is not used, find</td>
</tr>
<tr>
<td></td>
<td></td>
<td>out why; then recommend corrective</td>
</tr>
<tr>
<td></td>
<td></td>
<td>action.</td>
</tr>
<tr>
<td>Performer organizations</td>
<td>Do the work needed to get the products out the door per agreed-to budgets</td>
<td>Tailor the institutional process</td>
</tr>
<tr>
<td></td>
<td>and schedules.</td>
<td>for use on their projects.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use the process to do the work.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recommend improvements</td>
</tr>
<tr>
<td></td>
<td></td>
<td>based on usage experience.</td>
</tr>
</tbody>
</table>
over a decade ago because its largest customer, the U.S. government, forced it to do so to compete on contracts. Since then, the firm has run hot and cold when it comes to process primarily due to external factors. In the mid-1990s, process took a back seat to running lean because the company was positioning itself to be purchased. The focus was on maximizing profit by minimizing overhead and capital expenses. Because money wasn’t available at this time for process, the organization reverted to the way it had done business in the past. This wasn’t difficult because the people who stayed on during these years were the old-timers who were familiar and comfortable with the old ways. As a result, the organization lost its momentum and regressed from CMM Level 3 to Level 2 process maturity rating.

About three years ago, things took a positive turn. Senior management loosened up the purse strings when it decided to stay in the aerospace electronics business. Managers focused on several opportunities and won several important contracts. They started acquiring firms to help infuse new talent and technology into business areas that had become stale. Most important, they recognized the importance of process and started to make an effort to recapture the improvements they had made in the past. To win several new contracts, they reformed the process group and tasked it with leading the charge to being reassessed CMM
Level 3. They took people with talent from key programs and placed them in the process group. Once a plan of attack was in place, they found the money to fund it. Senior management got serious about process improvement when customers said “good job” after independently assessing the firm at Level 3. Several of the key players in the process group were given incentive awards based on performance. Everyone seemed excited by the turn of events.

The process saga continues today unabated. While senior management remains supportive, program management is not convinced that it buys them anything. Their experience with process and other corporate initiatives has been spotty. Some have seen other corporate initiatives (e.g., total quality management [Schulmeyer, 1992]) come and go. Their reaction is either to wait and see or to stonewall the process group’s efforts to enlist their support. Others recall their past experiences with process and either like it or hate it. There seems to be no middle ground. Most in the middle do not share senior management’s enthusiasm for process. They say that they need to be convinced before they will spend their project funds on yet another process initiative. What being convinced means, you are not sure of. But your job is to address their concerns and convince them that spending lots of money on process is a worthy cause. Senior management supports you. They say that all you need to do is tell them what you need.

The current goal is to reach CMM Level 4 within two years. As Figure 5.2 illustrates, senior management has tasked the process group with the responsibility of leading the charge to Level 4. Senior managers are motivated again by competitive factors. Big procurements are coming up, and they believe that being at Level 4 will help their chances of winning the contracts. Their customer told them that their chief competitor is at Level 4, and they want to level the playing field.

**CURRENT BUSINESS CLIMATE**

Business is booming, and your people seem happy. Marketing is reporting that sales are at an all-time high this quarter. To meet the forecasts, the firm will have to double the software staff during the next year to handle all the planned upgrades and new project starts. Where the firm will get all these skilled people is a concern, and management is starting to lose sleep over the challenge. Many managers seem to be spending most of their time recruiting. As expected, the firm is also experiencing some turnover because the market for good software people, even in the face of an economic downturn, is hot.
As expected, morale is high. Management has refocused its energy to capturing market share from positioning the company to be acquired. As a result, managers have become more open to investing in process, people, and technology. However, every time they are asked for money, they respond with “I don’t understand why you software guys need this.” They don’t seem to grasp what software people do. As a result of internal pressure, they’ve started to make limited strategic investments in their software competitive capabilities and capacity. Process improvement is the central theme because CMM Level 4 is believed by many to be a necessary prerequisite for winning future contracts with the government. However, every time you ask for money for process improvement, management asks for additional justification.

The software organization’s four-part strategy for improvement is illustrated in Figure 5.3 [Reifer, 1997a]. As already mentioned, process improvement comes first. It is viewed as the central thrust because it provides the organizational framework for the other improvements (tool the process, train people in its tailoring and use, and so on). In parallel, the workforce is being educated and trained according to newly established career paths. The training is aimed at fanning out the process to projects. As the third thrust, open systems and architecture concepts are to be introduced into the business units. These will be the unifying concepts for developing future product lines/families. With architecture comes use of more COTS and increased software reuse. Last, a structure has been developed to enable projects to prioritize and better tap the internal research and development (IR&D) efforts. This will enable the research leads to justify continuance in next year’s battle of the budget.

**Software Improvement Strategy**

- **Discipline the Software Process**
  - Proactive, not reactive
  - Optimizing
  - CMM-based

- **Standardize Products**
  - Architecture-based
  - Massive reuse
  - Open systems

- **Professionalize Workforce**
  - Career paths
  - Skill-based education and training

- **Quicken Use of New Technology**
  - Project sponsors for IR&D
  - Good idea programs
Let's complete the picture of the current business climate by looking at other factors that management believes directly contribute to software cost, productivity, quality, and staff continuity:

**Overall experience**  The current workforce experience averages over 20 years. The reason for this is staff attrition. During the lean years of the early 1990s, the younger engineers were frustrated as the firm downsized, and many of them left. Jobs were plentiful, and it was easy for them to find positions with other firms who were hungry for talent. Not so for the older troops. Jobs were not so easy to find for them, and they were reluctant to leave because they were vested in the profit-sharing plan.

**Staff capabilities and morale**  Workers are energized and enthusiastic about management’s focus on process. They view positively the return to process and management’s willingness to invest in them, their environment, and technology. In addition, the positions that were eliminated during the early 1990s have been reinstated, and younger and more dynamic workers are being hired. The newcomers are more open to doing things differently.

**Education and training**  The addition of new workers has opened up a myriad of training opportunities for the entire engineering and management workforce. In-house courses have been created to introduce non-software program managers to software. Seminars are being held in software engineering and other interesting topics. This focus on education and training has created a climate in the organization that views change more favorably.

**World-class facilities and environment**  Management has recently started to invest in better facilities, equipment, and tools for software workers. Managers recognize that they are undercapitalized and are trying to provide engineers with pleasant offices and powerful workstations, networks, and tools. They have justified this investment in terms of reducing turnover. By creating a conducive working environment, they hope to reduce the number of people leaving for what they perceive to be greener pastures.

**Technology adoption**  Internal research and development funds for software technology development have tripled this year. This turnabout resulted after a major client criticized management for not spending enough on technology development. The firm is now more committed to changing the technology’s look and feel.
enough on software research. Efforts to channel software architecture, smart agent, and network security developments into the product lines were funded. The challenge is finding people to work these projects. The best people always are too busy because they are working the high-visibility, tough projects.

As part of these initiatives, your firm has tasked the process group to develop a game plan for reaching Level 4 by the end of the year. The plan will have to be sold to middle management. As already mentioned, skeptics and critics abound. While upper management is championing the effort, many in the middle are still resistant to yet another process push. They need more convincing. This situation dictates the following seven rules of engagement when the game of *Dungeons and Dragons* is played for real.

1. *Let the numbers do the talking.* Your primary job is to figure out how to get the recalcitrant middle managers into your corner. Because their bosses support the initiative, they will talk the talk. But because of the perceived risks involved, they won’t walk the walk. Your job is to get these managers to embrace joint efforts with projects aimed at reaching Level 4. You know these managers relate to numbers. They will support any believable proposal that helps them get the product out the door cheaper, quicker, and better. Your strategy for getting support must be to let the numbers do the talking for you.

2. *Don’t assume that program managers understand software.* Most of the middle managers don’t come from a systems/software background. Most are old-fashioned hardware engineers who grew up during a time when software represented a problem, not a solution. Some were hired from the customer community because they understood the operational aspects of the system. Others were hired right out of college and have been with the firm for 30 to 40 years. When you talk with them, most of them tell you war stories about the good old days when there wasn’t any software to worry about. Most of them need to update their knowledge of systems and software because their technical skills are outdated.

3. *Justifications must be made at a project level.* Project management is tasked to maximize profit and keep costs to a minimum. In support of these goals, middle managers are ranked and rated on their ability to deliver quality products that satisfy agreed-on requirements on schedule and within budget. They aren’t rewarded when they spend money on processes that benefit the firm at large; they receive recognition, promotions, and bonuses when they achieve project goals. To get their support and sponsorship, you must build a bulletproof business case that justifies your pro-

4. *Let’s get creative.* A lot of his managers are creative, many managers are creative. They Nguyen, you must be creative. Managers will be creative. They need a plan that is not a process. They need a plan that is new, fresh, and innovative. They need a plan that is not just another process push.

5. *Process is annual.* This process is annual. Don’t worry about it in June. There is money is done. We started the process in September. One support is for the process.

6. *A project plan is essential.* To be a successful project plan is essential. To be a successful project plan is essential. To be a successful project plan is essential. This plan will be essential for success.

7. *Your managers don’t like change.* They don’t like change. They don’t like change. They don’t like change. To earn respect, you must earn respect. Two years is important.
posed investment of time, talent, and energy in terms of project benefits. Even though they care about their peers, they need incentives to motivate them to help others.

4. You must address past experience, both pro and con. The organization has a lot of history and folklore associated with process improvement. Unfortunately, many managers view previous initiatives negatively. That’s because they burned a lot of resources and generated few perceived benefits at the project level. To succeed, you must address this experience as you sell your program. Otherwise, these managers will sabotage your effort and try to steal your funding. To overcome these obstacles, you must convince these critics that your efforts will help them get their jobs done cheaper, quicker, or better. If you can’t, your plan is doomed.

5. Your plan must focus on near-term results. Budgets for initiatives such as process improvement are funded as overhead activities. Such budgets are developed annually. To win funding approval, you must generate near-term results. If you don’t, you could lose your funding to competing projects. The budget process starts in June with proposals for both new and continuing programs. Competition for money is keen, and there is never enough money to fund everything that needs to be done. Worthy projects are screened and ranked by business area managers in September. Criteria for the final selection and funding revolve around how well you support business area objectives, projects, and new business proposals. If these managers aren’t sold on reaching Level 4, you will lose out.

6. Any software processes must be compatible with your existing management infrastructure. The process initiative establishes the underlying framework that you will use to pursue the remainder of your four-part software improvement strategy. To be accepted, you must make sure that the processes you come up with integrate with and into your firm’s existing management infrastructure (organizational structures, decision processes, management reviews, metrics, and so on). Otherwise, the software processes you devise will be perceived as out of sync, and their usefulness will be viewed as marginal. In other words, you can’t change the way middle and upper management does its job. Even if the processes it uses are flawed, changing them is outside the scope of your improvement effort.

7. You must track and demonstrate accomplishment of goals. Because middle managers are goal-directed, you must crisply define your goals, justify them, track them, and celebrate their accomplishment (or note their failure). This is how you will earn respect in your organization. Although setting a goal of reaching Level 4 within two years is enough for seniors, those in the middle expect you to tell them why it is important to their bottom line. They want to know what you expect to achieve
in quantitative terms. They also expect you to track and report progress and deliver what you promise. If you don't, they will probably recommend using the money allocated for this worthwhile activity elsewhere during the budget process next year.

**DEVELOPING A GAME PLAN**

Your process group has been devastated by turnover since you reached Level 3 two years ago. Last year, management cut the group's budget in half when it was trying to reduce overhead expenses. Then three of the five remaining engineers left to work on projects because they felt that process group assignments were parking positions. The best people in your firm seem to be put to work on projects, not overhead assignments. That's where the promotions are and what's considered fast-track. Besides you, the only people who are left in the group are two retirees who were hired as consultants to work with projects because they have credibility and two part-time courseware developers. Fortunately, you have just received permission to hire an analyst to help implement your Level 4 metrics requirements.

To get the group back on track, it must be reinvented and revitalized (its mission and people's perceptions of its role must be changed). In addition, the group must be staffed with high achievers who can generate results quickly.

Besides you, the process group has four people filling the eight slots that are illustrated in the organization chart in Figure 5.4. As mentioned, two retirees are on board and acting as liaisons with projects. These two senior practitioners are held in high regard by the working troops. Your other two employees are part-timers from academia whom you brought on to develop education and training materials. The candidates for the two process developer vacancies are well-thought-of people who are between assignments. The third vacancy will be filled with the new metrics hire. Your task is to develop a game plan for reaching Level 4 as the team is being built and middle management is being convinced to support it.

![Figure 5.4: Process Group Organization Chart](image-url)
The budget for the process group for this year is $2.4 million:

- Personnel (four employees) $700K
- Consultants (two retirees) $450K
- Academicians (two part-timers) $200K
- Assessment support $200K
- Education and training $250K
- Promotion and outreach $250K
- Specialized Web tools $100K
- Web site development $250K

The budget funds the staff’s developing and fanning the process out to project organizations ($1,350K), training ($250K for seminars brought in from the outside), promotion ($250K to prepare a newsletter, work with the customers, and attend conferences), and assessment support ($200K to bring in an external assessment team). The major new task to be pursued by the process group is Web site development ($350K). The group will put a process asset library on line to make their products (processes, training materials, improvement metrics) easily accessible to those who have access via the firm’s network. They will continue tracking their performance using the metrics data on defects and costs that they collect as part of their process.

There is lots of pressure on you and the process group to move to Level 4 within two years. In its zeal to support the process improvement initiative, senior management took your suggestion to make process one of the factors in its middle management salary bonus scheme. Because their paychecks will be directly affected by the move to Level 4, many middle managers have suddenly awoken to the importance of process. They have started asking questions about what’s involved in software process improvement. Unfortunately, the burden of success or failure falls on you because management cooperation with the process group isn’t listed as one of the criteria for use in computing the bonus.

You are assuming the role of the process group manager for this exercise. Assume that you have just been promoted to fill the position. How do you get started? Do you staff the group or plan first? Who should get involved; what should they do? When do you kick off the effort? How do you build and energize the team? Where do you find qualified people for the group? What are upper management’s expectations? Which program managers support you? Will they collaborate with you and permit their programs to serve as pilots? Senior management has summarized these questions in one: “What are your
plan of action and milestones?” Middle managers ask a different question. They want to know, “What’s in this initiative for me?” In other words, they are more interested in the business case justifications than in plans for moving to Level 4.

Before developing a game plan, some factfinding should be conducted. What is the group really being asked to accomplish? Is Level 4 the game, or is the game changing the culture as discussed in Chapter 1? Do you know? Have quantitative objectives for the effort been finalized and agreed on? If not, seek clarification. What are the measures of success for the effort, and how will they be demonstrated? How do these measures relate to the goals set for the effort? Will an outside observer be required to confirm that you’ve reached Level 4, or can you use someone from another division? Again, if you don’t know, you should find out. You need to dig deep to discover hidden agendas.

Luckily, the real objectives have been defined using the goal–question–metric (GQM) paradigm discussed in Chapter 2. As shown in Figure 5.5, these goals and their related measures of success focus on productivity improvement to justify the expenditure of $2.4 million annually to pursue process improvement. “Where did this number come from?” you are probably wondering. When you dig, you find out that the numbers were developed by projecting productivity gains achieved three years ago into the future. Because the numbers are being questioned, you will have to determine their merit as you develop your plan and business case.

**Figure 5.5: GQM Worksheet**
You can start your plan effort in earnest. Because you’re relatively new to process improvement, you have brought a management consultant on board to guide you through the planning process (for at most six months). Your boss has recommended that you pay for this expert with surplus funds. Your strategy here was to avoid political infighting by providing someone credible whom everyone could agree with (or blame) to help craft the business plan/case. The process the consultant recommends following is shown in Figure 5.6.

The process in Figure 5.6 homes in on steps 4 through 7 of the seven-step business planning process discussed in Chapter 2 (develop a business plan, prepare the case, sell the idea, and execute) (see Figure 2.4). The process in Figure 5.6 starts with vision and translates it into the work that needs to be performed via goals using activities to group tasks that are similar. Let’s briefly discuss what needs to be done during each of the steps.

**Start the Process by Involving Stakeholders**

Start by establishing an infrastructure aimed at getting stakeholders involved in the planning process. Charter a steering committee and working groups. Invite key people and influence makers to participate. Hold your kickoff meetings as soon as you can. Build group consensus. Publish and promote the results via your Web site. Address the legitimate concerns raised by these groups. Show participants that their inputs are important by acting quickly on their suggestions. Identify stakeholder “win” conditions, and plan to use them to prioritize your work accordingly [Boehm, 1998].

![Figure 5.6: Recommended Planning Process](image-url)
Develop a Top-Level Vision and Strategy

Building on the discussion in Chapter 2, write down what the initiative is trying to achieve (vision) and how you are going to make it happen (strategy) in simple language that anyone can understand. You will be surprised how hard it is to write such a document. Once you have your ideas on paper, review the document with your stakeholders, improve it, and have them take ownership of it. This document, which should go on your Web site, will help you explain the initiative, its goals, and how the goals are going to be achieved to anyone who asks.

Define the Work to Be Performed

Based on your GQM objectives, define the tasks that need be done in the near and long term. The work breakdown structure shown in Figure 5.7 organizes the work that needs to be performed to achieve these goals using activities and their subsidiary tasks (Figure 5.7 shows the mapping between tasks and activities). For each task, define the inputs, outputs, deliverables, and dependencies. Don’t get bogged down in details when you start. Begin by identifying the most important things you must do to be successful. Cut the list to the five most critical things you need to do using stakeholder inputs and win conditions to establish priori-

<table>
<thead>
<tr>
<th>Activities</th>
<th>Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Process development</td>
<td>1.1 Write processes/practices</td>
</tr>
<tr>
<td>2. Education and training</td>
<td>2.1 Develop/update courseware</td>
</tr>
<tr>
<td>3. Process rollout/project support</td>
<td>3.1 Pilot processes/gather feedback</td>
</tr>
<tr>
<td>4. Process assessment</td>
<td>4.1 Conduct periodic assessment</td>
</tr>
<tr>
<td>5. Promotion and outreach</td>
<td>5.1 Promote process</td>
</tr>
<tr>
<td>6. Support environment</td>
<td>6.1 Establish Web site</td>
</tr>
</tbody>
</table>
ties. For example, statistical process controls must be deployed to achieve Level 4 (task 3.3). But you are not yet staffed to handle this challenge. You could correct this problem as you develop your plans by filling one of your vacancies with someone with the skills to tackle this task. The person you hire in turn can act as a mentor and focus on developing core competency in this needed area.

In Figure 5.7, each activity is broken into related tasks. A task is defined as the smallest unit of work subject to management accountability. Once properly defined, tasks generate products, consume resources (people, time, and so on), and may be related to or constrain one another. For example, the support environment provides stakeholders with timely access to process resources stored in the process asset library via your Web site. Two tasks are involved in this activity: developing the Web site and hosting the process asset library (PAL) on it. As already mentioned, the PAL is the mechanism that the process group plans on using to make its processes, training materials, newsletter, and help desk support available via the firm’s network to those who have authorized access. In addition, the PAL facilitates collaboration with working projects through specialized tools such as Microsoft’s NetMeeting.

As you talk with your stakeholders about implementing these steps, the consultant offers the following suggestions relative to their accomplishment:

*Establish expectations or management will set them for you.* Work with your stakeholders to set realistic expectations for reaching Level 4. Otherwise, the expectations they set for you may not be achievable. Set reasonable but aggressive goals that you can live with. Use these goals to prioritize the tasks to be done by their perceived importance. As part of this effort, brief management, and get them to concur with the group’s ratings. You will need everyone’s support at one time or another as the initiative unfolds.

*Do things that middle managers think are important.* Respond to your middle managers by completing tasks that they feel are important to the success of their projects—typically tasks that will have a positive impact on their project’s ability to deliver promised products on schedule and under budget. If you help these managers, they will help you. Make them look good, and they will become your strongest supporters. Fail to deliver, and failure will haunt you forever.

*Do the easy things first.* As you prioritize tasks, look for easy things that can be done quickly to generate positive effects. Completing them will help
you display your initiative in a positive light. Perceptions are important. Middle managers view overhead activities such as yours negatively especially when they don’t see anything of value coming from them. To counter this, promote your early successes. Make the people in the middle believe that you are a producer. Then they might be more apt to work with you when you ask them to pilot your processes on their next major upgrade.

Start with an operational concept. Develop operational concepts for use as you kick off your Level 4 initiative. A list of concepts is provided along with a brief summary in Table 5.2. These concepts should be couched in terms of the methods and tools that you will use to deploy needed new processes, pilot them, and transfer them into use throughout the organization. Most important, these concepts should provide management with feedback about your progress and whether or not you are achieving your numbers.

Then develop an actionable plan. Using these operational concepts and your WBS, develop a plan of action and milestones aimed at realizing the expectations you’ve set. Be practical: focus on the things that can be easily accomplished. Emphasize tasks in your plan that will move your Level 4 processes into project use in an ordered and systematic manner. Your challenge is to get busy people (e.g., the influence makers and the 20 percent responsible for 80 percent of the work) to use something new. That’s why you need to budget to support the early adopters who agree to try the new processes.

Use available, free resources. Try to take full advantage of the resources you have access to and are paying for as part of overhead charges. In other words, tap the expertise that exists within your firm in areas where you may need specialized help (accounting, legal/licensing, and so on). The trick is finding out where and to whom to go for help. For example, find an expert who understands intellectual property rights to help you when dealing with software licensing issues. This person can help you cut through the legal mumbo jumbo and exercise the advantage you may have when negotiating licenses with vendors. Be careful to avoid “experts” who say it can’t be done. Their job is to tell you how to get it done, not to try to deter you from innovating.

After listening to the consultant’s suggestions, you continue with the steps illustrated in Figure 5.6.
### Table 5.2: Operational Concepts

<table>
<thead>
<tr>
<th>Operational Concepts</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process development</td>
<td>Address the approach you will use to get to Level 4. You plan to exploit industry experience and best practices to expedite this job. You will hire an outside firm to help you, especially in statistical process control. This firm will play a major part in the assessment.</td>
</tr>
<tr>
<td>Transition</td>
<td>Get projects to use new processes. You will pilot the use of the processes to demonstrate their feasibility. You will also identify early adopters who will work with you as part of the pilot evaluation team to bridge the gap to widespread adoption.</td>
</tr>
<tr>
<td>Deployment</td>
<td>Determine how to deploy processes once they are released for use. You will provide a process expert as liaison with the project. Education and training will be provided on a just-in-time basis.</td>
</tr>
<tr>
<td>Configuration management</td>
<td>Focus on maintaining integrity and version control of process group products. You will use existing methods and tools to do this job. Your steering group will be your change control board.</td>
</tr>
<tr>
<td>Quality assurance</td>
<td>Make sure processes are not released prematurely. You will enlist stakeholders to do work product inspections using the process in place for software development.</td>
</tr>
<tr>
<td>Distribution management</td>
<td>Address how processes will be distributed as they are released/updated. Your initial thoughts focus on providing access via a Web site.</td>
</tr>
<tr>
<td>User support</td>
<td>Answer users’ questions, and provide users with timely support. You will staff your Web site with a part-time person. You will publish frequently asked questions and capture metrics on user satisfaction. In other words, you will run the site like a business.</td>
</tr>
</tbody>
</table>

### Build Partnerships

Plan to collaborate with those people and projects that agree to support your effort. Deal only with people you know and trust. Ask these key people to serve on steering committees and working groups and to provide you with pilot projects. Ask advice and seek their confidence. Recognize that you have to give up some of your control so you can receive theirs.
something to the partnership. If all you do is take, what's in the relationship for others? Volunteer to spend money to help your partners succeed. Put people on the project to off-load them so that they can satisfy their obligations. Do things on a noninterference basis so that it won't seem like their success is in jeopardy.

**Plan to Sell, Sell, and Sell**

Recognize that those in positions of power change as people move on for whatever cause. Just as soon as you’ve educated one set of executives, another set comes in the door. Don’t get too comfortable. Be vigilant, and look for dragons. An overhead budget the size of yours is always a target for takeover. Remember you are a success if you are viewed as one. In response, create the illusion that you are successful in all your actions, lectures, and written work. The saying that “success breeds success” is not just a platitude; it’s reality. Projects will support you when it is thought you will deliver. Ride the white horse, and people will wave as you pass by. This discussion stresses the need for you to promote your successes, even when they are small ones. Recognize that the sum of a large number of small successes is often perceived as one large success.

After several iterations, you feel comfortable with your plan of action. You’ve also completed a top-level business case using productivity improvement to justify your expenditures. The consultant recommends that you review the plan in its draft form with your champion to make sure that it meets the mark and you haven’t forgotten anything. Your champion is busy, but his second in command assures you that he will like it.

**PROCESS MATURITY: ARE THE INVESTMENTS JUSTIFIED?**

During an orientation briefing, the new vice president in charge of research and development asked why the firm was spending $2.4 million a year on software process improvement. Nobody in the room, including your champion, could provide a satisfactory answer (he hadn’t seen your material, so he couldn’t defend you). The productivity projections that you offered as justification were torn to shreds. The debate was hot and heavy. Most of the middle managers in the room grinned and vocally took sides against you. Finally, the vice president said: “If they (the process group) can’t justify this expenditure, we should spend the money elsewhere—research?” Your boss called and asked you to provide an answer the next day. You are scheduled to brief this new vice president at noon tomorrow.
Most of the information you've seen in the literature about process improvement has harped on the benefits without translating them into numbers. While interesting, such discussions don't help you make a strong business case for software process improvement. Luckily, the consultant you hired has access to justification numbers. Most of them were generated internally as a product of your Level 3 metrics activities. He points to several papers when you query him about the other sources of numbers: [Butler, 1995], [Clark, 2000], and [McGibbon, 1996]. He also identifies some internal benchmarking data that you can use to justify the projections that were originally used to justify your budgets. Your plan is to use this hard data to convince the new vice president that investment in process improvement pays off. However, because outsiders will be in the meeting, you must couch the numbers in such a way as to keep them secret. If you don't, the outsiders might leak proprietary information to your competition.

**Accelerating Productivity Gains Through Process**

You decide to use the published industry productivity benchmark of 100 source lines of code per staff-month (SLOC/SM) as a starting point to demonstrate the gain associated with process improvement. As stated in Chapter 4, productivity is defined as the ratio of outputs (SLOCs) to inputs used to generate them (SM of labor). The consultant supplies data that shows that the average productivity gain your firm experienced during the past five years was approximately 20 percent annually as it moved from Level 3 to Level 4. During the early years, the gain was just 10 percent annually. After considerable analysis, you believe that your firm was able to accelerate productivity gains by 10 percent per year (from 10 to 20 percent) by pursuing a process improvement strategy. These numbers correlate well with the initial business case that was developed to justify the original initiative. When the outsiders leave, you plan to show the new vice president a chart that confirms the trends. Of course, your firm pursued other improvements during this time span. For example, they made additional gains by increasing capital expenditures to acquire new equipment and tools.

For you, the acceleration results in a cost avoidance averaging $2 million annually over a five-year investment time span based on the analysis summarized in Table 5.3. When you put your real numbers in, the avoidance grows to $4 million annually. After digging some more, you find out that this is how the numbers were generated three years ago. You also learn that the trend lines used then to project benefits have held true throughout this time period. However, you will use the generic numbers for this computation to protect leakage of the numbers by the outsiders.
Table 5.3: Savings Attributed to Accelerating Productivity from 10 to 20 Percent Annually

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current productivity</td>
<td>100</td>
<td>110</td>
<td>121</td>
<td>133</td>
<td>146</td>
</tr>
<tr>
<td>(SLOC/SM; 10% nominal gain)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accelerated gain (20%)</td>
<td>120</td>
<td>144</td>
<td>173</td>
<td>208</td>
<td></td>
</tr>
<tr>
<td>(SLOC/SM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional number of SLOCs that can be generated via acceleration assuming 600 engineers</td>
<td>72,000</td>
<td>165,600</td>
<td>288,000</td>
<td>446,400</td>
<td></td>
</tr>
<tr>
<td>Cost avoidance (SLOC)</td>
<td>$3.6 million</td>
<td>$8.3 million</td>
<td>$14.4 million</td>
<td>$22.3 million</td>
<td></td>
</tr>
<tr>
<td>($50/SLOC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cumulative cost avoidance</td>
<td>$3.6 million</td>
<td>$11.9 million</td>
<td>$26.3 million</td>
<td>$48.6 million</td>
<td></td>
</tr>
</tbody>
</table>

It should be noted that you were very conservative in your calculations. For example, you assumed that there was no gain during the first year of the improvement strategy. As another example, you did not assume that your workforce grew as the workload did. Instead, you addressed the growth via cost avoidance in terms of SLOC that you did not have to generate. You defined productivity in terms of SLOC per staff-month because this was the metric that your firm historically captured and reported for software. You discarded newer productivity metrics based on function and applications points because they were too business system oriented [Jones, 1998]. When you asked the consultant, he stated that the SLOC/staff-month metric seemed appropriate because you could use the improvement trends to build a business case that justified your expenditures for the improvement initiative.

The $50 per SLOC assumption is also a best case. Your cost per SLOC actually ranges from $50 to $150. You took the bottom end of this range to be ultraconservative in your projections. If you had taken the $150 figure, middle management would not have believed your numbers because they would have seemed to be too good. For the internal revenue, you plan to use $100 per SLOC. This correlates well with industry benchmarks for productivity and represents a more realistic saving.
Early Defect Detection and Correction

While the productivity numbers look good, you want to show more benefits in your business case justification. When asked, the consultant points you to defect data that your process group has been collecting for several years. The defect introduction and removal rates have been tabulated, compared, and reported using data that you have captured throughout the software life cycle as a by-product of the work product inspection process that you inserted as part of your Level 3 efforts. They demonstrate convincingly that the process improvements you've made lead to earlier defect removal (before release to the field).

You now want to compute the benefits early defect detection buys you. Like yours, several firms the consultant has worked with have been capturing such data to quantify these benefits from their projects. These firms have caught defects early and avoided the costly problems associated with their propagation after the systems have been fielded. They too have used work product inspections to capture the data. As these firms moved from Level 3 to Level 4, their data showed that the average number of errors that went to the field was reduced by a factor of between 20 and 25 percent. Again, this correlates well with your experience. In addition, the majority of these defects were caught in the requirements and design phases instead of during test and integration. According to your internal data, the cost of fixing a defect when it is found during these early stages saves you as much as 40 percent of your historical repair costs (saves $20 per defect based on 100 percent rework). For the 12 major programs that your firm has under development, these savings translate to $1.2 million annual cost avoidance, assuming

\[
(12 \text{ projects/year}) \times (10 \text{ defects/K SLOC entering test}) \times (500 \text{ K lines/project}) = 60,000 \text{ defects}
\]

\[
(60,000 \text{ defects}) \times ($20/\text{defect cost avoidance}) = $1.2 \text{ million}
\]

In addition, these firms found that their product quality was better than yours. The average defect density for their software products when released to the field was between 0.1 and 0.5 defects/K SLOC. Your defect densities are averaging between 5 and 8 errors/K SLOC. From your viewpoint, lower defect density translates into improved customer satisfaction. However, neither you nor your consultant knows how to quantify the impact of improved customer satisfaction and include it as part of a business case.

The consultant reported that being at Level 4 also had other advantages. He pointed to several firms that used statistical process-control U-chart reports to reallocate effort from processes that were under control to those that were more
error-prone. You asked, “What is a U-chart?” The consultant explained that U-charts are statistical process-control tools that plot error trends between control limits. Using these charts, he showed you how to determine how well processes were behaving [Florences, 2001]. The results were extremely heartening because they showed that Level 4 firms were more concerned with controlling variability then writing waivers to get out of processes. You plan to use this information if needed to win arguments.

**Exploitation of COTS**

As you are tabulating your ROI using productivity improvement and earlier defect detection and correction factors, your consultant has a brainstorm. “Why not add the benefits we are deriving through COTS and product lines?” he suggests. As with many defense contractors, you have moved from custom hardware and software solutions to those offered off the shelf. Like others, you have found such solutions risky and error-prone. To counter these tendencies, you have adopted an inspection and licensing process aimed at improving your advantage with suppliers.

Based on the consultant’s inputs, you can quantify the benefits associated with enterprise-wide software licensing. For example, Northrop saved over $2 million annually by adopting improved licensing processes [Reifer, 1999]. This saving was achieved at the project level by coordinating software license purchases to gain volume discounts via increased buying power. As part of its licensing initiative, Northrop was also able to negotiate license changes to transfer spare seats to projects other than those designated in the original license agreement. Finally, Northrop put a “try before you buy” practice into operation. Trial use enabled the company to identify defects that had to be corrected before purchasing the product. Defects often had side effects that biased their error data and were difficult to find and fix. Per these results, you believe that you can save at least $1 million annually through improved licensing.

**Movement to Product Lines, Architecture, and Systematic Reuse**

Now you are ready to quantify the gains associated with moving to product lines. You have limited experience here. Therefore, you must rely on the consultant’s inputs relative to published data [Weiss, 1999]. Implementing architecture and
systematic reuse is traditionally the hardest part of the strategy. The reason behind this is that the process guidelines used, such as the SW-CMM [Pauk, 1995] and SPICE [El Emam, 1997], offer little help in this area. Because your company is a defense contractor, other restrictions make it very difficult for you to share software across projects. For example, security provisions may force you to discard existing designs because their disclosure could provide insight into how to break into the system. Sharing is not something that your customers currently encourage or provide incentives to accomplish.

You ask the consultant for recommendations on how to bring product lines, architecture, and systematic reuse into your organization. Luckily, your firm has been pursuing architecture-based reuse for over a decade as part of your internal research and development efforts. The research team has completed a domain analysis and developed reference architectures, both hardware and software, to facilitate reuse at the system level [Bassett, 1996]. Their goal was to deploy this architecture using product line management concepts by making it part of the processes their engineers use to do their work [Reifer, 1997b]. Using their recommendations, you plan to incorporate reuse provisions into your processes as you develop them for Level 4.

The benefits the research team attributed to reuse are many and substantial. Systematic reuse saves money and time by making big jobs smaller. Table 5.4 illustrates this phenomenon using a sensor system software example. Using product line concepts effectively cuts the size of the job almost in half. Reuse in this context is planned, and the components themselves are designed for reuse. For example, alarms are instantiated from some existing alarm class by tailoring, not redesign or coding. Variability is controlled. The direct reuse of existing components previously developed to populate the selected product line architecture results in the savings shown in Table 5.4.

The benefits of cutting the size of the job in half can be quantified using a cost model like COCOMO II [Boehm, 2000]. Running the model for the example summarized in Table 5.4 results in the effort and duration estimates shown in Table 5.5. Both nominal and shortest development time options were estimated. The only cost driver varied was the process maturity (PMAT) factor that was set to reflect a Level 4 organization. Table 5.5 shows that you can cut the estimated duration in calendar months by about 20 percent and effort in staff-months by about one half in both cases (most likely or nominal and shortest duration estimate).
This example illustrates the benefits associated with systematic software reuse. It suggests that each of your projects can save as much as half its costs (about $5 million) and a year in schedule through reuse. In reality, your systems are much bigger and more complex than that shown in Table 5.4. As a result, your cost saving should exceed $5 million on each new system you generate using the product line architecture you have developed and the infrastructure you have introduced. Multiply these savings across all your product lines/families, and you estimate that you can realize savings of at least $10 million annually once the technology has been transferred into operations. However, the increased costs associated with maintaining your architecture and with designing assets for reuse need to be accounted for in your calculations. These costs are factored into the worksheet you have prepared to address the costs/benefits associated with systematic software reuse, which is shown in the accompanying box.
## COST/BENEFIT ANALYSIS WORKSHEET

<table>
<thead>
<tr>
<th>Nonrecurring Costs</th>
<th>Tangible Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain engineering—completed on R&amp;D</td>
<td>Cost avoidance $10 million</td>
</tr>
<tr>
<td>Reusable assets—project-funded</td>
<td></td>
</tr>
<tr>
<td>Infrastructure development—done by process group</td>
<td></td>
</tr>
</tbody>
</table>

### Recurring Costs (per year)

- Architecture maintenance $200K
- Asset maintenance 500K
- Process updates 100K

### Total Costs $800K

### Total Benefits $10 million

**Note:** This analysis assumes that the nonrecurring costs associated with developing the asset population for the architecture were treated as sunk costs because they were incurred on R&D.

You believe that most of the nonrecurring investment costs as shown must be funded by projects as part of their budgets or covered by existing investments.

Your systematic software reuse initiative is just starting. It represents a major challenge because it will force you to change the way you do your business. Instead of developing products for projects, you will develop product line architectures for business units. In addition, major changes to the way you currently manage your business will be required to facilitate this changeover. Luckily, processes and tools that facilitate the change to systematic reuse exist and are starting to be used commercially [Jacobson, 1997]. But it would be unfair to assume that you will reap any benefit from this initiative during the next two years. Therefore, you have not included the incremental contribution of this reuse initiative in your ROI computation.

## QUANTIFYING THE RETURN ON INVESTMENT

You still have to answer the vice president. But the consultant earned his keep by providing you the information you need to compute the return on investment. Your briefing, which is illustrated in Figures 5.8 through 5.13, is aimed at educating and convincing the new vice president of research that the money allocated
to software process improvement will be well spent. The briefing is short and to the point. It assumes that the vice president doesn’t want cluttered charts that get into the details. When you reviewed your charts with your boss, he threw more than half of them out. The six that survived are the charts he helped you construct. You were disappointed when he told you not to bring the consultant. But after thinking about the briefing throughout the night, you concluded that he was right. This should be an inside job.

The chart in Figure 5.8 sets the stage by emphasizing the importance of software to the firm. It lets you talk about government requirements and competitive pressures. It also lets you set expectations.

The chart in Figure 5.9 highlights your current software improvement strategy. It lets you talk about your motivation for the initiative, strategy, and past performance. It then lets you describe the four-part improvement framework you plan to use to reach Level 4 within two years.

The chart in Figure 5.10 identifies $6.2M in cost avoidance that you will realize. It shows reuse but allows you to state that you have not considered this in the ROI calculation because of timing. Because of long lead times required to change the culture, the forecasted benefits will accrue outside the two-year window you have been given to reach Level 4.

The chart in Figure 5.11 shows the process group budget and its current headcount. The bottom line on the chart allows you to emphasize importance of process as the framework for other improvements. It also lets you move to the ROI chart.

**SETTING THE STAGE**

- Software sells hardware and keeps our factories operating
- Software currently accounts for more than 50 percent of our engineering costs
- Our government customers fear software costs are spiraling out of control
- Our competitors have mounted aggressive software improvement programs

**Figure 5.8:** Executive Briefing—Background
WE HAVE NOT BEEN IDLE

Software Improvement Strategy
(Reach Level 4 in two years)

Discipline the Process
Standardize the Products
Professionalize the Workplace
Quicken Use of New Technology

This four-part improvement strategy has impressed our customers, reduced turnover, and yielded a positive return on investment.

Figure 5.9: Executive Briefing—Strategy

STRATEGY YIELDING MANY RETURNS

Early Error Reduction
- Cost avoidance = $1.2M/year
- Increased customer satisfaction based on quality

Systematic Reuse
- Cost avoidance = $10M per year
- Faster to market
- Ten times the quality
- Just starting—expect to reap benefits within three years
- Process can be built with reuse in mind.

Exploitation of COTS
- Cost avoidance = $1M per year
- Improved maintenance
- License leverage with vendors

Productivity Improvement
- Cost avoidance = $4M per year
- Improved capabilities and capacity

Figure 5.10: Executive Briefing—Returns
COSTS HAVE BEEN MINIMAL

Process Improvement Strategy

- Process Development
- Project Support
- Promotion and Outreach
- Education and Training
- Project Support
- Support Environment

- Group's current annual budget is $2.4M/year
- Staff of eight including two part-timers and two retirees
- Lots of worker and upper-management support
- Process improvement provides the structure for all elements of the strategy

Figure 5.11: Executive Briefing—Costs

The chart in Figure 5.12 performs the ROI calculation. It takes the annual benefits in the second year and divides them by the investments necessary to pull them off. It lets you highlight both the tangible and intangible benefits. Finally, it lets you talk about software reuse as an added benefit (i.e., you don't have to bet the farm on it).

Besides setting expectations, your final chart (Figure 5.13) asks for the vice president's support. You took your boss's advice when he said: "Never brief an executive without asking for something." You asked for advice and for something you knew the vice president could help you do. Your request will endear you to him because it was designed to make him look like a hero.

As expected, the briefing went well. The vice president was inquisitive, supportive, and helpful. His parting remark was, "Count on me to help you get middle management in your camp." Your boss was pleased, and your team was thrilled at the prospects of having even more senior management support. However, you are wary. This vice president is too new to the firm to really help you pull your Level 4 initiative off in the planned time frame. All you can do is stop him from causing damage.
RETURN ON INVESTMENT

<table>
<thead>
<tr>
<th>Tangibles</th>
<th>Intangibles</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROI = ( \frac{\text{Annual Benefits}}{\text{Investment}} )</td>
<td>Better product quality</td>
</tr>
<tr>
<td>ROI = ( \frac{6.2\text{M}}{2.4\text{M}} )</td>
<td>Quicker to market</td>
</tr>
<tr>
<td>ROI &gt; 250% in second year</td>
<td>Increased customer satisfaction</td>
</tr>
<tr>
<td></td>
<td>Improved employee morale</td>
</tr>
<tr>
<td></td>
<td>Responds directly to customer requirements</td>
</tr>
</tbody>
</table>

Assumptions: Cost avoidances in Figure 5.10 realized with exception of reuse, which kicks in after we reach CMM Level 4.

Figure 5.12: Executive Briefing—ROI

WE NEED YOUR SUPPORT

- Reaching Level 4 will take two years, assuming things go as planned.
- Our major challenge is to get those in the middle on our side (bonus is a good start). Anything you can do to help would be appreciated.
- We have a number of operational challenges:
  - Need help in staffing—getting our requisitions through the system
  - Need help in licensing—buyer support

Figure 5.13: Executive Briefing—Finale

The disturbing news was that only one middle manager besides your boss was present at the briefing. You invited a dozen and only one showed up. Most complained that they were just too busy to attend. You are concerned that their lack of attention signals their lack of concern.
GETTING EVERYONE INVOLVED IN PLAYING THE GAME

You’ve learned to play the game of Dungeons and Dragons well. Just as in the real game, you’ve handled the unexpected. Things seem to be going well. Now’s the time to shore up your executive support by putting a steering committee in place. It is also apparent that you need to do something to get more middle management involvement.

The steering committee is the easiest group to establish. In fact, it was created years ago when your predecessor kicked off the Level 3 initiatives. A charter exists, and membership is defined. Over the years, the committee stopped functioning. Now’s the time to have your champion(s) call a meeting. Of course, you will have to furnish the agenda and prepare the invitations. Take advantage of the opportunity created by giving the briefing you’ve prepared for the vice president of research to others who might be able to provide useful advice.

Getting middle managers and workers involved is harder. Typically, this is done using an engineering council, working groups, and the like. Generating interest is not difficult. However, getting the right people to participate is a challenge. That’s because the people you want are busy working projects. The key to success is to get these people involved in something they are interested in and can contribute to. If interested, they will make the time to attend and contribute to the effort. Avoid the temptation to set up a bunch of working groups all at once. I have seen this tactic fail repeatedly. Don’t foster meetings for the sake of meetings. Groups such as these need the pressure of hard deadlines to come up with results. Ask your council to address transition issues. Task your working groups to solve technical problems that impede transition.

Figure 5.14 identifies the committees, councils, and working groups you believe need to be created to reach Level 4.

- **Executive steering committee** Gets senior management involved in an advisory role to provide the initiative with oversight and direction.
- **Software engineering council** Gets line of business management involved in coordinating product line architecture issues and reuse process recommendations.
- **Software working groups** Gets the key performers and influence makers involved in the initiatives by having them recommend ways to support the process improvements with education and training, technology, methods, languages, and tools.
Figure 5.14: Committees, Councils, and Working Groups

REINVENTING AND REFRESHING THE ORGANIZATION

I think reinventing staff organizations such as process and quality assurance groups is a good idea. Engineers assigned to such staff groups get stale once they’ve put in more than three years of service. Being in an audit and support role, they forget how hard it is to develop and deliver quality products under extreme deadline pressures. They need to relearn what I call the humility of the trenches. That’s why I believe staff groups should be populated with rotators and a small, core professional team. The rotators bring enthusiasm and fresh ideas to the table. The core team focuses the energy on the job at hand and maintains the knowledge base.

Revitalizing such staff groups is hard work [Caputo, 1998]. You are lucky. Most of the deadwood in your group has left. You can focus on bringing in the talent you need to reach Level 4. As mentioned earlier, the skills, knowledge, and
abilities of these people are quite different from those needed to reach Level 3. At Level 3, you were trying to institutionalize an organizational process for software. To fully understand and be able to tailor the process, your staff had to become intimate with it. Because you were working with projects, collaborative skills were at a premium, as were teamwork abilities. In contrast, Level 4 focuses on using statistical process controls to reduce variability and increase effectiveness. Statistical analysis and metrics skills are now needed to take the data being collected and make sense of it [Wheeler, 1992]. While collaborative skills and teamwork abilities are still desirable, your staff needs to focus on using metrics data to quantify the process and making it work efficiently.

To reinvent the organization, start by crystallizing its mission. If reaching Level 4 within two years is your primary goal, try to avoid putting any of the Level 3 transition tasks in the mission statement. This will cause the organization to lose focus and become schizophrenic. To maintain emphasis, add details to your action plan as they become available. Groups tend to be shaky when their plans are vague. Don’t let this happen. Continually refine your plan so that you can use it as a road map to deliver what you promise on schedule and within budget.

Refreshing a process group is fun. To succeed, the consultant recommends that you staff your process group with a core team of three and a manager as planned. The manager of the group is its chief spokesperson. This person handles the delicate interfaces with both middle and senior management. To do this effectively, you believe that this person needs to be a veteran of the organization. You are pleased because you have this qualification. The next two people are called the process arbiters. They understand the process fully and can be called on to explain its provisions in detail. Besides writing processes, these people maintain the process knowledge base and manage the process asset library. The fourth person is the metrics analyst. This person is in charge of the metrics strategy and maintains the measurement database. You call on this person to address metrics questions and handle statistical process control issues.

To bring in fresh ideas, you plan to bring in specialists to supplement the core group on a rotation basis. The specialists will change to reflect your need for different talent at different times. Looking at the organization chart in Figure 5.4, we see that there would be four such slots in the process group. Two part-time slots are initially allocated to courseware development. The other two full-time slots are allocated to project interfaces. The technique of hiring recent retirees as consultants to work with projects is a good one. Of course, the people you hire must be knowledgeable and respected. If they aren't, their use may backfire.
SUMMARY

This chapter provides a process improvement case study. The hypothetical firm has just kicked off an effort to reach CMM Level 4 within two years. The case showed how to justify the expenditures in terms of early error detection and correction, exploitation of COTS, accelerating productivity gains, and moving to product lines, architectures, and systematic reuse.

KEY POINTS

✓ Managing process improvement activities is like playing a game of Dungeons and Dragons. To avoid the dragons, you have to anticipate when and where to make your next move. Otherwise, you might wind up in the dungeon.

✓ It takes a game plan, senior management support, and a solid business case to win the game of Dungeons and Dragons.

✓ When briefing senior management, always ask for something. This makes managers feel as if they are contributing to your effort.

✓ Most organizations have the information to build a business case. First, develop your plan of action. Then, estimate the cost for putting the plan into action. Finally, forecast the benefits, and use them to justify your planned expenditures.

✓ When justifying initiatives, cost avoidance is preferred to cost reduction because it deals with future expenditures.

✓ When determining benefits, categorize them as tangibles or intangibles. When the returns are marginal, the intangibles can be used to help tip the scales and justify the effort.

✓ Any combination of the four approaches discussed in this chapter can be used to pull together a business case. When using them, err on the conservative side. Nothing discredits numbers more than the perception that you are being overly optimistic with them.

✓ Never be casual with numbers. Define them and limit them as precisely as you can.

✓ Don’t be afraid to suggest that organizations be reinvented and refreshed when justifying future initiatives.
References


