As companies throughout the United States have reorganized over the last decade to become more competitive, their corporate R&D organizations have either had to cut their staffs or to go out of existence all together. Consequently, most corporate R&D managers are constantly looking for ways to improve their operations in order to maintain their current technical capabilities—or to just keep their organization in existence.

The experiences of one corporate R&D organization serve as an example of what corporate R&D organizations can do to improve their operations. This corporate R&D organization—called R&D Organization A throughout this chapter—was assessed twice in terms of how effectively it managed R&D. The first assessment was conducted during the first year of its efforts to improve its operations. The second assessment was conducted approximately two years later.

Although R&D Organization A improved its operations significantly over the two years between the assessments, it still needed to address some issues. Whereas in the beginning it needed to improve its R&D strategic planning and the planning and management of projects, later—after making progress in these areas—it had to work on improving the management and development of the members of the R&D staff.

In sum, R&D Organization A faced many of the same challenges all corporate R&D organizations face. In addition to improving the management of the technical work, the climate in the R&D organization, and the coordination with the company’s operating divisions, corporate R&D managers must concentrate on strengthening their most important resource—the R&D people themselves.

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THE FIRST ASSESSMENT
This assessment of R&D organization A noted several areas of improvement in how the group’s technical work should be managed, but the major weaknesses identified concerned the climate in the group. Each of these assessment areas is outlined in the following sections.

Assessment of the Management of the Technical Work
The management of the technical work was assessed in terms of four activities:

- Selection of projects.
- Planning and management of the technical part of projects.
- Planning and management of the nontechnical parts of projects.
- R&D strategic planning.

Although interrelated, the technical and nontechnical parts of projects are distinct. The technical part concerns the technical issues addressed in the projects (e.g., the development of a new chemical polymer). The nontechnical parts concern issues related to marketing, manufacturing, finance, and purchasing, which greatly affect whether an R&D project is commercially successful.

Depending on the activity in which R&D Organization A was assessed the first time, it ranked between above average to below average in its management of the technical work.

Selection of Projects: Above Average (with a Qualification). In general, R&D Organization A selected the right projects to work on. Sometimes, of course, the group’s choice of projects was not ideal, but no R&D organization can always work on the right projects.

One procedure that helped R&D Organization A select the right projects was its practice of requiring—in most cases—sponsorship from an operating division of the company before it started a project. This practice ruled out many projects in which these divisions would not be interested.

Another practice that helped R&D Organization A select the right projects was its concentration on serving only a fairly small fraction of the many divisions in the company. Rather than trying to satisfy all of the divisions’ needs, R&D Organization A focused on serving those divisions whose needs it could best meet.

R&D Organization A’s one area of improvement involved the need to emphasize exploratory R&D more. By requiring sponsorship from an operating division for projects, R&D Organization A could eventually have shortchanged the exploratory R&D that was important for the company, but which none of the individual divisions was interested in. R&D Organization A’s managers, though, were aware of this potential problem and wanted to take steps to do more exploratory R&D.
Planning and Management of the Technical Part of Projects: Average. R&D Organization A's planning and management of the technical part of projects could be looked at in terms of how projects were managed at that time and in terms of how projects could have been managed given the same technical people, but a different way of organizing projects.

First, in terms of how projects were managed at that time, R&D Organization A did an above average job. In general, R&D Organization A's projects, which usually consisted of only one to three people, did not go off track because of technical reasons. On the other hand, R&D Organization A was much less effective when evaluated in terms of how effectively it might have managed its projects by using the same technical people but by organizing the projects in a different way. The group's project teams were very small, but technical people from other parts of R&D Organization A (e.g., from the process engineering group and the analytical support group) usually provided technical support to the projects. These other technical people were not considered part of the project teams, however, and usually only responded to the project leaders' requests for help. By working in this way these other technical people were not able to produce the best results possible because they did not understand the underlying requirements of the projects and were not able to help shape the projects' objectives in areas in which they were knowledgeable. In other words, because R&D Organization A's projects were not planned and managed in an interdisciplinary way, they were not run as effectively as they could have been.

On balance, therefore R&D Organization A had an average ranking in this area. It was doing a good job of planning and managing the technical part of its projects given the existing system, but it should have developed a new system of planning and managing projects that stressed interdisciplinary technical efforts.

Planning and Management of the Nontechnical Parts of Projects: Below Average. R&D Organization A's weakest activity in the management of the technical work concerned the planning and management of the nontechnical parts of projects—that is, factors related to the application of technology, such as marketing, manufacturing, finance, purchasing, and quality assurance. In this area both R&D Organization A's technical people and technical managers needed to become far more competent. The following weaknesses were identified (starting from the most serious weakness and going to the one that could be most easily corrected):

- Did not understand why nontechnical parts of projects must be addressed by corporate R&D personnel.
- Were not interested in learning about the nontechnical parts of projects.
- Did not know how to analyze the nontechnical factors involved in projects.
- Did not understand the environment in the operating divisions.
- Did not know the people in the operating divisions personally.
Did not have the skills to communicate with people in the operating divisions.
Did not have enough opportunities to visit people in the operating divisions.

There was a certain percentage of members of R&D Organization A who had the first weakness—though it was not known how large this percentage was. These members of R&D Organization A did not realize that it was part of their responsibility to understand how technology could be applied. As one moved to each of the higher levels, the percentage of members of R&D Organization A who had a particular weakness increased. For example, there were more members of R&D Organization A who knew that they should have understood how technology could be applied, but who were not interested in learning about this, than there were members of R&D Organization A who did not know that they should have understood how technology could be applied. This pattern continued up to the last level—the level of not having opportunities to visit people in the operating divisions. In this case, the percentage of members of R&D Organization A to whom this applied was very large.

All in all, R&D Organization A's weakness in this activity was quite serious. Therefore, one of the group's greatest needs was to find a way to help as many technical people move up as many levels as possible. By strengthening the planning and management of the nontechnical parts of projects overall, the members of R&D Organization A could link their work more closely with the operations of the company's divisions.

**R&D Strategic Planning: Above Average (with a Qualification).**

R&D Organization A's strategic planning was above average. For example, R&D Organization A did an excellent job of analyzing how well its projects fit the company's business goals. It assessed its portfolio of projects in terms of the company's competitive position (i.e., dominant, strong, or weak) and different technology categories (i.e., base, key, and pacing). R&D Organization A also assessed its portfolio of projects from other perspectives, such as in terms of the reward potential of a project (i.e., high, medium, or low) and the probability of commercial success (also high, medium, or low).

Nevertheless, although these kinds of analyses were very important, they did not constitute R&D strategic planning. Rather, they represented a very sophisticated approach to selecting R&D projects. In other words, with regard to those projects whose feasibility had already been proven—and to a few other more exploratory projects—R&D Organization A did an excellent job in making sure that these projects fit the company's business goals.

Real R&D strategic planning, however, consists of more than just making sure that an R&D department's projects fit the company's goals. It also consists of asking many speculative questions about what new technological developments that are relevant to the company may occur in the world, what new business opportunities may be created in the next several years, how customers' requirements may be shifting in the future, how government regulatory requirements may be changing, and other similar issues.
Getting better answers to these kinds of questions should have provided the framework for a strategic analysis of what R&D Organization A was doing. Through such an analysis the group may have found that it was not doing or even considering doing important projects for the company. R&D Organization A's managers were aware of this shortcoming and intended to correct it. Because of this, R&D Organization A still deserved an above average ranking—with a qualification. When R&D Organization A tackled genuine R&D strategic planning, its ranking would improve to above average or better.

In general, R&D Organization A was performing reasonably well with regard to its management of the technical work. Its biggest challenge was to go from having a contractual relationship with the operating divisions of its company to having a true partnership with these divisions. On the whole, R&D Organization A selected the projects that the divisions asked for—and delivered the technical products specified. For R&D Organization A to have worked at its full potential though, it needed to develop a partnership with the divisions. It not only should have been doing what the divisions asked for, but it should have been doing what the divisions would need but did not ask for. Furthermore, R&D Organization A not only should have delivered the technical products specified, but should have made certain that the technical products really fit the divisions' needs and were transferred effectively.

What a partnership with the divisions should have consisted of could be looked at from another perspective. Three necessary actions that a corporate R&D organization must carry out to develop a partnership with its company's operating divisions are: to think strategically about the divisions' long-term needs, to carry out the technical activities effectively, and to deal effectively with factors related to the transfer and commercialization of technology. When a corporate R&D organization just does what is required of it, it focuses only on the second action—carrying out the technical activities.

To work at its full potential, the R&D group must expand its perspective. It needs to think about where science is going and about how new scientific developments will affect the company's businesses. It also needs to understand the many nontechnical factors involved in technology management, which will determine whether new technology will be transferred and commercialized successfully. With respect to carrying out the technical activities, R&D Organization A was excellent. With respect to dealing with the factors related to the transfer and commercialization of technology, however, R&D Organization A was weak. It was in this area that R&D Organization A had to work the hardest if it wanted to reach its full potential.

**Assessment of the Climate in the R&D Organization**

Within R&D Organization A, there was widespread support for improving the operations of the R&D organization. In addition, members of R&D Organization A respected the intentions of the R&D management team.
Although there were some misunderstandings between the R&D management team and the members of the staff, the technical people, in general, believed that the management team had the best interests of the entire group at heart.

Five weaknesses related to the climate in R&D Organization A were identified:

- A lack of a concrete plan concerning how the organizational changes being considered should be carried out.
- Many R&D managers were not spending enough time with the technical contributors who reported to them.
- Communication within R&D Organization A was not good.
- The analytical support group had not been able to agree on a new system for improving assignment scheduling.
- A lack of mechanisms for facilitating both the generation of new technical ideas and learning about new technical developments.

Each of these is discussed in the following sections.

**Lack of a Concrete Plan Concerning How the Organizational Changes Should Be Made.** The biggest single weakness in R&D Organization A's operations was the lack of a concrete plan concerning how the organizational changes aimed at improving operations would be carried out. For over a year there had been a great deal of discussion by the R&D management team about improving operations, but very little discussion about how to accomplish this.

The how question though was as important as the what question. The what question concerning goals represented just the tip of an iceberg related to the organizational changes. The how question, however, concerned the rest of the iceberg. In answering the how question, the management team was forced to look at how it might really change daily life within R&D Organization A—that is, at how it might change its standard operating procedures, change what the R&D people’s attitudes about their work was, how projects were conducted, how information was communicated, how meetings were run, and so on—so that the goals of any organizational changes could actually be achieved. Because these issues were so important, how the R&D management team dealt with them influenced the success or failure of the planned organizational changes far more than the goals that the R&D management team had set. During the previous year, the R&D management team had not dealt effectively with issues related to how organizational changes could be implemented in the daily life of the group.

**Many Managers Were Not Spending Enough Time with the Technical Contributors Who Reported to Them.** R&D Organization A's problems with these organizational changes were compounded by the fact that many of the R&D managers did not spend enough time with the
technical contributors who reported to them. Organizational changes are always difficult to make, but the members of any organization can work their way through these changes if they feel that there is close communication between them and the managers to whom they report. On the other hand, managers who spend little time with the members of their organization cannot expect them to change how they work, and the organizational changes proposed will fail.

Managers in R&D Organization A, in general, did not communicate well with the staff. They did not talk enough about the group’s projects, and they did not work hard enough to explain to individual contributors what their role would be in the changed organization. Consequently, many members of the staff grew to mistrust the R&D management team.

Communication within R&D Organization A Was Not Good.

Communication within R&D Organization A was not good for other reasons as well. First, there was a widespread lack of understanding about the strategic direction of R&D Organization A and about how projects were selected. Second, communication between the members of the staff themselves was not as good as it should have been. Third, within R&D Organization A there were some cases in which technical contributors were afraid of asking questions about their work.

Both R&D managers and members of the staff contributed to the widespread lack of understanding about the strategic direction of R&D Organization A and about how projects were selected. On the one hand, the R&D management team needed to explain better where R&D Organization A was going. In particular, it needed to explain how projects were selected and why the projects chosen were being carried out. On the other hand, the members of the staff should have taken more initiative in finding out how decisions were made in R&D Organization A and why it had selected certain projects.

Members of the staff also needed to take more initiative in communicating with each other. Frequently individual contributors did not seek help from their colleagues with a technical problem until they had exhausted all other routes. That is, rather than draw upon their colleagues’ experience as quickly as possible, they sought help only when absolutely required. Because of this, many individual contributors in R&D Organization A worked less effectively than they could have because they communicated so little with each other. This poor communication about technical problems even occurred within groups in R&D Organization A.

In addition, there were cases in R&D Organization A in which technical contributors were afraid to ask questions about their work, even though they did not understand what they were supposed to accomplish. This indicated not only poor communication but also a lack of trust, and both R&D managers and staff members needed to deal with this mistrust in order to
improve communication. Having technical contributors carry out tasks that they did not understand was not the way to improve operations.

**The Analytical Support Group Was Not Able to Agree on a New System for Improving Assignment Scheduling.** Because it was overloaded with work, the analytical support group of R&D Organization A had earlier attempted to establish a new system for improving how assignments within the analytical support group were scheduled. Unfortunately, although all of the members of the analytical support group agreed that the existing approaches for scheduling assignments were not working effectively, they did not agree on what the objectives of a new system should be.

Some members of the analytical support group perceived the problem of scheduling assignments as basically an administrative problem that simply required more administrative help. Other members of the analytical support group perceived the problem as a lack of coordination among the members of the group—or, specifically, the way in which each technical person within the group could schedule his or her own assignments regardless of what others were doing. In their view, all of the procedures involved in scheduling assignments—from defining the task, to determining the analytical or test procedures, to estimating the resources required, to documenting the results—would need to be considered in developing a new system.

To make matters worse, not only did the members of the analytical support group not agree upon the objectives of a new system, they did not even realize that they disagreed. Because of these misunderstandings, many members of the group perceived the effort to improve coordination as an attempt to control how they carried out their work and therefore refused to cooperate. Consequently, the effort to develop a new system for improving how to schedule assignments failed.

Parenthetically, it should be mentioned that other groups within R&D Organization A probably would have had as many difficulties coordinating their activities as the analytical support group had. Given the way in which projects were defined within R&D Organization A, however, individuals within the other groups did not, on the whole, have to work closely with each other. Therefore, they could go their own way and communicate only when required. The members of the analytical support group, however, did not have this option. They were faced with many more requests for services than they could handle, and they had to work closely together in order to handle all of these requests. Thus, they faced problems that individuals in other groups within R&D Organization A could avoid.

Nonetheless, regardless of how other groups within R&D Organization A could have operated, the analytical support group needed to develop a new system for improving how assignments are scheduled. When the members of the group did not work together in handling the many requests for their services, they affected the work of both R&D Organization A and the operating divisions.

Within R&D Organization A there was very little discussion about new technical ideas or about new technical developments outside the group. At one time “popcorn busts”—that is, brainstorming meetings at which popcorn was served—were used within R&D Organization A to bring members of the staff together to generate new technical ideas, but these meetings had not been held for quite a while. It also had been a long time since outside speakers—for example, from universities or provided by vendors—were invited to present their ideas on new technical developments. R&D Organization A needed to take action to correct these weaknesses.

THE SECOND ASSESSMENT

R&D Organization A made significant progress in improving its operations over two years. Its scores on various activities in the management of R&D are shown in Exhibit 1 at the time of the first assessment and then at the time of the second assessment.

Although most of R&D Organization A’s scores involving the management of the technical work were already fairly high at the first assessment, it

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Exhibit 1
R&D Organization A’s Progress in Two Years

<table>
<thead>
<tr>
<th>Activities</th>
<th>1st Assess</th>
<th>2nd Assess</th>
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<tbody>
<tr>
<td>Management of the Technical Work</td>
<td></td>
<td></td>
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<tr>
<td>Selection of projects</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Planning &amp; management of the technical part of projects</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Planning &amp; management of the non-technical part of projects</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>R&amp;D strategic planning</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Climate of R&amp;D Organization A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of a concrete plan concerning how the organizational changes would be made</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Many managers were not spending time with the technical contributors who reported to them</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Communication within the laboratory was not good</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>The analytical support group was not able to agree on a new system for improving how to schedule assignments</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Lack of mechanisms for facilitating (A) the generation of new technical ideas and (B) learning about new technical developments</td>
<td>3</td>
<td>6</td>
</tr>
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continued to improve over the two years between assessments. R&D Organization A's scores concerning its climate, however, were quite low two years before. Over the two years R&D Organization A made great progress in improving all of the scores concerning climate.

R&D Organization A continued to improve or maintain a high level in the selection of projects and R&D strategic planning. In fact, R&D Organization A's strategic planning improved greatly. However, two new areas were cited for improvement in R&D Organization A's strategic planning: the group needed to do more exploratory thinking when considering new projects and it needed to improve the process of winnowing down 200 R&D proposals to the 20 proposals that it eventually approved. Both of these areas for improvement were recognized by members of R&D Organization A's strategic planning group. The strategic planning group realized that it needed to ensure that there was more time to think outside the box when considering new projects and to do more homework beforehand on the merits of the 200 R&D proposals before it began winnowing them down to 20.

R&D Organization A also made major progress in planning and managing the technical part of projects. Efforts over the two years to get all technical people in the group to realize the value of cross-disciplinary teams were quite successful, and the subsequent cross-disciplinary discussions in these teams were major contributors to this improvement.

Finally, R&D Organization A made major progress in planning and managing the nontechnical parts of projects. By instituting a state-gate system for evaluating ongoing projects—whereby projects were reviewed at successive stages in terms of a variety of technical and nontechnical criteria—and by improving the capabilities of project leaders, R&D Organization A strengthened its planning and management of the nontechnical parts of projects. A major area for improvement, however, continued to involve the development of the management capabilities of project leaders.

Significant progress was also made in improving the climate of the organization. Most important, the management team of R&D Organization A was no longer mistrusted. Management within R&D Organization A, in practice, encompassed at least 20 or more people—rather than five people as it had been two years before. Who was considered part of the management team depended on the activity, since there were specific groups within R&D Organization A that took the lead in R&D strategic planning, in improving support services, and in improving project leadership.

One area in which R&D Organization A still needed to improve related to the abstractness of the model that described the overall management structure. Although the operations management team that had developed the model did not think it seemed abstract, some members of R&D Organization A's staff found the model to be extremely abstract and considered it to be more of a hindrance than a help in improving operations. Consequently, the management operations team needed to implement this model gradually and
to explain the proposed organizational changes to the staff at each stage and in very concrete terms.

Managers in R&D Organization A also were spending much more time with the technical contributors—though there was still some room for improvement in this area. In addition, communication within R&D Organization A as a whole improved. This improved exchange of information took place at regular business meetings within R&D Organization A, in the evaluations of ongoing projects at stage-gate reviews, and at lunch, in the hallways, and so on.

In general, communication within the various groups within R&D Organization A also was very good. However, one of the groups lagged far behind the rest of R&D Organization A in correcting the weaknesses identified in the assessment two years before. Although problems involving communication within this group were very apparent in the second assessment, they did not stand out two years before when communication within all of R&D Organization A was poor. After communication throughout the rest of R&D Organization A improved, however, it was clear that this group still had problems, for two reasons.

The first reason was rivalry between the members of the various project teams within this group. Much of this rivalry stemmed from a previously supported practice that involved each project team finding its own users in the operating divisions and then operating independently to make sure that its project was implemented. Although such a strategy may have seemed reasonable at one time, it hurt R&D Organization A as a whole because the project teams did not cooperate with one another when cooperation was needed. The project teams within this group therefore had to learn to work together much better.

The second reason was that the manager of this group—who had rejoined R&D Organization A less than a year before—had a difficult time adjusting to a new and very different R&D Organization A than the one he had left several years before. This manager made mistakes, as he was the first to admit. Because he was beginning to understand the new culture of R&D Organization A and since the problems within this group were then clearly recognized by everyone, this manager—with the help of the R&D Organization A management operations team—would work to build better teamwork within this group in the future.

Finally, even though communication within R&D Organization A as a whole improved greatly, around 25% of the members of the staff still lacked knowledge about how projects were selected. For some reason these people had not been finding out about how projects were selected at the regular business meetings. This problem in communication, of course, needed to be corrected as soon as possible.

Of all of the areas for improvement identified in the first assessment, the area in which R&D Organization A had made the greatest progress was communication within the analytical support group. Two years before, there were serious conflicts within the analytical support group with regard to a new
system for scheduling assignments. During the next two years the members of
the analytical support group made significant progress in learning how to work
 zusammen and went from being the group with the most apparent problems to
 the group with the most teamwork, which was quite an accomplishment.

R&D Organization A also made progress in facilitating the generation of
new technical ideas and learning about new technical developments. The major
obstacle to further improvements in this area was an overcommitment by key
staff members to other activities, such as evaluating or conducting projects. This
obstacle needed to—and could—be overcome without too much effort.

**Another Set of Issues that R&D Organization A Needed to
Deal With**

Despite its progress, R&D Organization A needed to deal with new areas for
improvement. In rough terms on a scale from 0 to 100 (with 100 being the
best), R&D Organization A had progressed from a 40 to a 70 in two years.
During this period it had improved its R&D strategic planning, instituted a
process of stage gates for evaluating ongoing projects, and strengthened its
project management. To make further progress, however, R&D Organization
A had to address another set of issues—one that primarily concerned the
development and management of people.

Specifically, this other set of issues had to do with:

- Better implementation of the stage-gate system.
- Better ways of motivating the staff.
- Better career development.
- Better development of the management capabilities of the project leaders.
- Better planning and management of resources for projects.
- A higher level of professional communication.

Each of these is discussed in the following sections.

**Better Implementation of the Stage-Gate System.** The process of
evaluating ongoing projects through stage-gate reviews was working
reasonably well within R&D Organization A. It was not, however, working
as well as it could have been. Although the process resulted in the highlighting
of areas of concern in projects, the administration of stage-gate reviews was
more burdensome than it needed to be.

To improve the stage-gate system and make it less time-consuming, project
leaders needed to focus on the most critical questions to answer at each of the
gates. The more experienced project leaders intuitively understood which
questions were most critical and guided the stage-gate reviews to focus on
them. The less experienced project leaders, however, did not believe that they
had the authority to determine which questions were most critical. Therefore,
they attempted to answer them all, and the process became very burdensome.
Moreover, it was the project leaders group that should have taken the initiative in improving the stage-gate system. When the project leaders met though, they functioned more like a study group than as a management team that had the authority to shape all matters related to project management within R&D Organization A. The members of the project leaders group should have been asking themselves: What are those 20% of the issues that cause 80 percent of the problems in R&D Organization A projects? How can we streamline the process of evaluating ongoing projects while also not cutting out important matters that need to be addressed? By doing this, the project leaders would not only start improving the stage-gate system, they also would begin fulfilling their role as part of the management team of R&D Organization A.

**Better Ways of Motivating the Staff.** Surprisingly, most members of the staff of R&D Organization A felt that they were working far more effectively after two years, but having less fun. To become more effective over two years, members of the staff had tried very hard to be more responsive to the divisions’ needs and to understand issues related to commercialization. In dedicating themselves to serving the company’s needs, however, members of the staff assumed as a given what attracted them to science in the first place. This was the spirit of research. That they forget something like this was understandable. While focusing on being responsive, on commercializing technology, and on serving the company’s needs, they also tended to think that the science would take care of itself.

When the spirit of research is forgotten in doing science, however, R&D turns into just cranking out projects to meet deadlines rather than true investigation. In other words, when the spirit of research is forgotten, R&D becomes a grind rather than fun. To maintain the spirit of research while also working toward serving the company’s needs, R&D Organization A needed to provide recognition for accomplishments that did not relate to existing projects. In this way, both those accomplishments that helped the company immediately and those that might help the company in the future would get recognized.

**Better Career Development.** R&D Organization A needed to strengthen its career development in two ways. First, it needed to establish a more organized approach to guiding less experienced members of the staff with regard to how they could progress in their career. Second, R&D Organization A needed to put greater stress on mentoring. If R&D Organization A continued to allow mentoring to be solely dependent on individuals taking the initiative on their own, the needs of many less experienced members of the R&D Organization A staff would not be met. Consequently, R&D Organization A’s managers needed to continuously identify opportunities in which they could facilitate mentoring.
Development of Better Management Capabilities in the Project Leaders. Although the capabilities of R&D Organization A’s project leaders improved significantly, there was still room for improvement in how they managed the nontechnical parts of projects. One way to strengthened this aspect of their jobs was through the development of more practical training regarding planning and managing the nontechnical parts of projects. The seminars that the project leaders group had organized during the previous year had been somewhat useful, but because they were general seminars on project management there was a limit to how helpful they could be. Seminars by some of the more experienced project leaders within R&D Organization A about the trials and tribulations of past projects, on the other hand, could cover many of the more practical aspects of project management that general seminars did not cover.

For project leaders to continue to improve, however, more than just practical training was needed. For any of this training to be useful, all of the project leaders first had to accept their role, which involved not only technical management, but also project coordination concerning a variety of business factors. Roughly one-third of the 20 project leaders in R&D Organization A were excellent in project management. Another third of the project leaders had the potential to become excellent and were developing along that path. Finally, the last third of the project leaders would rather not have been project leaders at all.

Although such a breakdown among technical people with regard to capabilities and interest is understandable, a mismatch between R&D Organization A’s requirements and some project leaders’ interests existed. R&D Organization A could not afford to write off one-third of its projects as technical successes, but commercial failures. On the other hand, one cannot reasonably expect 20 or so scientists to all be interested in marketing, manufacturing, finance, and so on.

The answer to this dilemma rested with those seven or so project leaders who were not interested in project management and with the managers of R&D Organization A. These seven or so project leaders needed to decide whether they could become much more knowledgeable and interested in the nontechnical parts of project management. Those who felt they could should have then been given a chance to develop in this area. Others of these seven or so project leaders, however, might have decided that they were more interested in science than in project management. They should then have been given opportunities to participate on projects as technical contributors rather than as project leaders.

Better Planning and Management of Resources for Projects. As difficult as selecting projects might be at times, the selection of projects usually is easier than the planning and management of resources for these projects. The selection of projects occurs more or less once a year and is essen-
tially an analytical exercise. The planning and management of resources for projects, however, occurs day to day throughout the year and is as much a management task as an analytical exercise. Consequently, effective planning and management of resources for projects requires great teamwork. R&D Organization A needed to improve in this area in two ways.

First, the teamwork among R&D managers and projects leaders in this area needed to be improved. Although R&D managers and project leaders were good at reallocating resources when there was a crisis, they needed to become better at anticipating these needs—and then reallocating resources before there was a crisis.

Second, R&D Organization A needed to include future special projects in its system of resource planning. One of the most important lessons learned in R&D Organization A over the previous year was that a special project can cause great disruption in an R&D organization and that all of the regular projects can suffer because of this disruption. This was not to say that a special project should not have the highest priority with regard to all resources—or that past decisions about how resources were allocated to the specific special project Organization A had been working on had been wrong.

This was to say, however, that decisions about resources for special projects should be made in the same way as decisions for all other projects are. Then if a special project requires resources that other projects were supposed to get, the people who participated in these other projects would understand the rationale. Otherwise, as happened over the previous year, people on these other projects would not only not get the resources they had expected, but not get a clear explanation of why they had not gotten these resources. In other words, to prevent more frustration in the future, R&D Organization A needed to include future special projects in its system of resource planning.

**A Higher Level of Professional Communication.** R&D Organization A was made up of an extraordinarily diverse group of people. Many of the members of R&D Organization A were not born in the United States and had come from a culture quite different from that of the United States. Being made up of such an extraordinarily diverse group of people was an opportunity, not a problem. For R&D Organization A as a whole to have taken advantage of such an opportunity, however, everyone in R&D Organization A had to become much more sensitive to cultural differences.

This was because at the heart of the better management that R&D Organization A desired—that is, at the heart of better R&D strategic planning, of better stage-gate reviews, and of better project management—was better professional communication. R&D Organization A's challenge, therefore, was to learn—through training and other ways—how to function on a higher level of professional communication.
In sum, R&D Organization A made great progress by utilizing R&D management techniques effectively. Techniques, however, do not make an R&D organization world class. People do. R&D Organization A's next challenge, therefore, was to find better ways of developing and managing its people.

**CONCLUSION**

The experiences of R&D Organization A demonstrate what corporate R&D organizations can do to improve their operations. In the first assessment of R&D Organization A, several weaknesses were identified, particularly weaknesses involving the planning and management of the nontechnical parts of projects and the climate in R&D Organization A. During the next two years, R&D Organization A improved its operations significantly. Nevertheless, it found that even after it had improved significantly, it still needed to address other kinds of issues—issues involving the management and development of the members of the R&D staff.

The experiences of R&D Organization A, therefore, exemplify the challenges that corporate R&D organizations face. Besides improving the management of the technical work, the climate in the R&D organization, and coordination with the company’s operating divisions, corporate R&D managers must concentrate on strengthening their most important resource—the R&D people themselves.