



TENS OF THOUSANDS OF ENGINEERS read *Dilbert* and enjoy how closely the comic strip reflects their experiences with managers that appear indecisive, technically inept, and egocentric. You would think an invitation to join the managerial ranks would be undesirable, yet every year many engineers happily accept promotions that put

Engineers find surprises as they move into management

**ENGINEERS MOVING FROM THE OBJECTIVE
WORLD OF TECHNOLOGY INTO THE
PREDOMINANTLY SUBJECTIVE WORLD OF
MANAGEMENT FIND THE TRANSFORMATION
MORE CHALLENGING THAN EXPECTED.**

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them there. Some technology companies offer dual-track career paths that provide significant responsibility and visibility without requiring technologists to also manage, but these companies are still in the minority. Engineers who serve a company well by engineering good products on time are often rewarded with line-management positions. Talented and highly productive engineers often find that the only path to greater influence in a company and a higher income is to move to management.

Not every engineer moves into management just for the money. The belief that he or she will find and solve the problems that make management such an inefficient function motivates most engineers to accept the challenge. A promotion to management is most often a traumatic experience. One of the major factors contributing to an engineer's superior performance is the knowledge and experience he or she has accumulated. Experience and intuition help you correctly identify problems and develop leading solutions. Engineers often can instinctively make decisions; they "just know" a particular choice is right. This knowledge increases productivity and job comfort. Engineers who are candidates for promotion pos-

sess demonstrated capabilities to identify and analyze problems and to develop solutions. They pride themselves in keeping up with technological developments, because, in the current economy, being out-of-step with technology is often a precursor to unemployment. However, when promoted to management, engineers face a new set of problems with which they are unfamiliar.

Employers measure engineers by their creativity and their ability to solve technical, quantifiable problems. Once an engineer knows the problem, he or she derives the solution by applying technical principles that leave nothing to interpretation. Managers make relativistic decisions that require them to evaluate choices that are often difficult to measure or measurable only by the results that the decisions produce. In those cases, making the right choice requires experience—a quality that a new manager lacks.

If you are promoted from engineering to management, do not immediately set out to change your company. Give yourself some time to learn before you tinker. Walden Rhines, chairman and chief executive officer of Mentor Graphics, started his career as a design engineer at Texas Instruments. He understands both engineering and management personalities. He has no trouble identifying the common source of failure for engineers that are promoted to management, explaining, “Engineers tend to see the world as a very rational place: Things can be explained if you understand them; customers should buy the best product; people who cheat should fail; companies and people that do the best job will be discovered and rewarded.”

Rhines also contends that engineers are often more doers than talkers. According to Rhines, engineers believe that if they supply superior products at lower costs, they will be rewarded with growing sales and profits. However, he notes, the business world (and the world in general) doesn’t always operate rationally. He further notes that engineers are often frustrated by corporations’ need to excel at endeavors that engineers perceive as having little or no value, such as public relations, product promotions or glitzy customer events, product styling or packaging, or legal contracts. And, they are

AT A GLANCE

- ▶ Moving from engineering to management means learning to deal with factors that you can’t easily measure.
- ▶ Management is the information network of a company. Good communication skills are necessary for success.
- ▶ Politics is the art of fostering your cause while improving the common good.
- ▶ Good managers build teams; bad managers direct groups.

even more frustrated by what Rhines calls “organizational politics” or “self-promotion.”

When you are frustrated in your job, you not only become less productive, but also often lose track of the primary cause and focus only on symptoms. Rhines concludes that engineers’ frustration leads to “poor performance and disenchantment with management functions,” and often leads engineers to minimize the importance of “soft” business issues, such as marketing, or the feelings and aspirations of people working for the new manager. “Sometimes,” Rhines notes, “engineering managers are viewed as being just too frank when dealing with people, customers, press, and senior management.” Any career change is a traumatic and difficult process. Good ethics are essential, but you should temper them with the realization that, in a complex system, probability is the underlying law, and the sequence of events is stochastic. So, in the long run, good ethics will prevail, but in the meantime, you must be ready to accept injustice and inequality as real events.

After a promotion, avoid the notion that engineering management is just like engineering, only on a different level. Management is like any other profession; it requires specific knowledge and aptitude. Unfortunately, newly promoted engineering managers cannot take a sabbatical to learn the science of management. They have to learn on the job, and they often pay a price in emotional currency. You can increase your chances of success by getting to know your company from a different point of view, getting

to know the people you are now managing, and getting to know the procedures you will have to follow.

GETTING TO KNOW YOUR COMPANY

As a new manager, you will make mistakes. They are a necessary component of the learning process. To avoid, recognize, and correct them, you need guidance. Your boss can help, but it is often difficult to ask questions of and evaluate alternatives with the same person who expects you to be right and on time most of the time. You need to find yourself a mentor. If you have been in a company for any length of time, you probably know a manager that you respect. This manager need not be in a technical field, but he or she should be someone you admire and whose advice you trust. You can find such a person outside your company, but doing so is not always a good idea, because you will have to discuss proprietary matters to get the best advice. Once you have found someone, contact the person and ask whether he or she would like to be your mentor. The person will generally be happy to help. If the person doesn’t have time to dedicate to you, he or she might suggest an alternative source of help. Although you must always remember that your mentor is a busy person with a job to do, do not hesitate to make appointments and discuss problems—maybe over lunch or after work. His or her advice will help you more quickly understand your new role, and, although you will still make some mistakes, with a mentor’s help, you are likely to avoid costly ones.

The goal of a management organization in any company is to implement the corporate mission. So, as a newly promoted manager, you need to study that mission. In doing so, you will likely find that the mission is not about making money and not about developing perfect products. Making money is the result of fulfilling the mission and achieving the corporate goals. Infinite ways of making money exist in a free-enterprise economy, so a company with a mission to make money does not know how to choose among the various ways of generating a profit. As an engineer, you face interesting problems with attractive solutions that you think will make wonderful products. However, when an idea strikes

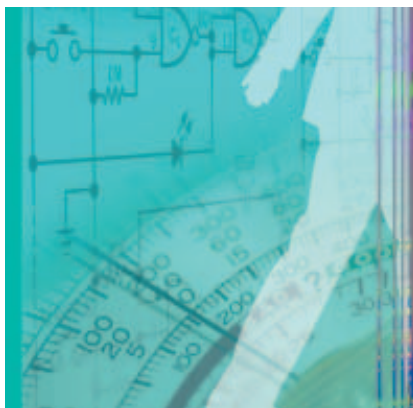
you, ask yourself whether it fits the mission. Do not ask whether you should modify the mission. Modification, especially in successful companies, will take longer than the span of the market window for your product.

Remember your experience as an engineer. Companies ship products when they are “good enough”—in other words, when they meet the requirements laid out by marketing and appear to be competitive. If engineers had just a few more days or weeks, they could make a product better, but most products generate revenues in spite of their imperfections. Now that you are in charge of a project, you are part of the group that defines what “good enough” means. Allow your company to take advantage of version numbers, which track changes in released products. Working on a released product has advantages over working on an only internal project. First, your company obtains revenue from the work already done, and second, you get the benefit of user feedback. Customers often use a product in ways you and the marketing team had not predicted. Thus, they find bugs or potential new functions for your team to work on.

As you begin to work as a manager, you will find that you spend a lot of time talking to people and don't have time to sit at your desk analyzing problems. Management is the communication infrastructure of a company. Managers form the information network through which all sorts of data flow. Every company has a different protocol to carry this information. In your new role, you need to learn how to package your message, how to filter what is social or not pertinent, and how to recognize what needs to be retransmitted to your team, your peers, or your bosses. Every company has formal and informal communication channels. Initially, you will most often take advantage of the formal channel. It has rules and simple protocols, so it will feel more comfortable. As your communication skills improve, you will find that at times a message is more effective when you present it in an informal manner—during a coffee break, at lunch, or even while jogging.

As a member of management, you have to work with other functional units in your company. Communicating with

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the marketing, finance, and personnel departments will demand a significant amount of your time. The best way to establish good communications with these departments is to understand their goals. The marketing department analyzes requirements and trends in the marketplace and satisfies them with products that fit the corporate mission. Its members speak a different business language from you and deal with perceptions and the changing landscape forged by economics, competitors' behavior, and technology, an area they may not understand well. You need to accept that a significant part of your job is to translate technical concepts and capabilities into terms that individuals without a technical degree can understand. Your contribution is to allow marketing to understand what is possible, how much it will cost to develop, and how long it will take. Your engineering skills will serve you well in this task. You need to integrate the collection of requirements given to you by your marketing colleagues and derive a product architecture that will allow you to estimate the composition of the implementation

team and the time and resources required to develop the product.

Your colleagues in the finance department aim to maximize profits for the company. They are not required to know anything about engineering or technology. So, although from time to time their requests or suggestions may seem illogical, you should not assume that they are incompetent. They will probably appreciate your taking the time to explain in laymen's terms the reasons why it might be difficult for you to abide by their directives. As a newly promoted manager, most of your interactions with finance will be through your manager. He or she will be the one that helps you through the annual budgeting process. The first time you are exposed to this process, you may think that your own boss no longer understands engineering.

Constraints that seem artificial guide the yearly budgeting process. Engineering managers need to understand that the process has both top-down and the bottom-up components. Top-down rules define the difference between capital investments and expenses, set the percentage of the budget that various functional departments can spend or invest, and establish the ratio between revenues and profits. Bottom-up input defines the changes required to increase productivity. During the budgeting process, your goal is to be “realistically pessimistic” by trying to anticipate expenses that will cause you to exceed the department budget for the previous year. Your boss probably had your job or a job similar to yours before you, so he or she can be of great help in explaining how to handle the budgeting process. In some cases, you will also find ways to be more efficient and save money.

The personnel, or HR (human-resources) department, strives to implement the corporate culture among the employees. In addition, it manages a number of state and federal programs that deal with employment practices. Many engineering managers see HR as a source of annoying forms and regulations. Engineers generally prefer to concentrate on solving technical problems and find human relations a necessary distraction that must be minimized. Engineers that are newly promoted to management often think that the new po-

sition means they will deal with more complex technical problems and will have more manpower at their disposal to develop a solution. They fail to understand that they have just been asked to reverse the priority, and good human relations are now the key to their success.

To normalize procedures throughout the company, HR uses forms. The forms can be both annoying and frustrating. New managers need to remember that the forms are equal throughout the company; thus, groups with different operating modes must use the same forms. Like most general documents, these forms are not perfect for any specific department but represent a common method that all departments can follow. Invariably, you will encounter situations that do not fit the form, and you will feel the urge to modify reality for the form's sake. In such cases, resist the temptation. Identify the purpose you want to achieve and modify the format of your input, so that the form works for you. Work with your manager; find out how he or she has dealt with this situation in the past. Your manager will likely be supportive, because he or she is facing similar problems. You can also ask people in HR for advice. Find out what goal motivated the form and what principles were used to develop it. Form problems are just like engineering problems; looking at the process used in developing the form can give you an insight on how to use it for your purposes.

GETTING TO KNOW THE PEOPLE

Aart de Geus, chairman and chief executive officer of Synopsys, is not only a leading businessman, but also an engineer who has received numerous industry awards, including being voted an IEEE Fellow. Commenting on what qualities an engineer needs to be a good manager, he explains that good manager must be able to think in the "gray zone." He notes that many engineers have learned to approach problems with a black-or-white attitude—that there's a right answer and a wrong answer, and the objective of a problem is to find the right answer. He explains, "The reality of management is that there is often not a clear right or wrong answer. There are various solutions that satisfy to a greater or lesser degree the constraints of the business,

YOU CAN'T UNITE YOUR ENGINEERS AS A TEAM SIMPLY BY GIVING ORDERS. THAT TACTIC DOESN'T EVEN WORK IN THE ARMED FORCES.



people, and technology involved. The ability to make good compromises among these factors is one of the key characteristics of a good manager." He notes that the timeliness of a decision is often as important as the quality of the decision, stating that "compromise, quality, and timeliness matter a great deal, but one without the others is no good at all."

According to de Geus, the biggest source of failure for engineers promoted to management is their tendency to discount the human factor. "Humans are, in a sense, gray-zone organisms," de Geus explains. In other words, they don't operate in black and white. De Geus sees a gap between employees who are motivated and those who are unmotivated, and those who feel like they're a part of a team and those who don't. He suggests that motivating and making your employees feel like they're a part of a team are skills that you don't focus on when training to become an engineer.

A newly appointed manager must quickly realize that he or she is not in charge of a department but the leader of a team. Being part of a team makes a group of people more productive and more creative. A group of people can sum up their qualities and knowledge, but conflicting aspirations and friction within the group will diminish the quality and timeliness of the results. Members of

a team share the same purpose and values; thus, they communicate better and are more focused on developing the agreed solution. A team needs a leader, not a boss. You can't unite your engineers as a team simply by giving orders. That tactic doesn't even work in the armed forces. You need to earn the respect of the people who work for you. They might already respect your engineering skills, but they need to develop respect for your leadership skills. Show that you understand the corporate mission and can explain how they can succeed in the company. It is important that you respect your team members, both as professionals and as individuals. If you have a problem with an individual, you should enlist the help of your manager and HR to deal with it. You were not taught in school or during your engineering life to solve human problems, and you do not want to learn to solve them through mistakes. Get help; observe the practices of experienced managers, and follow their advice.

Good communication skills are essential in your new management career. The best way to develop and improve communication skills is through practice. Most companies are now functioning using mostly verbal communications. Written communications are almost invariably limited to the use of forms. E-mail, although written, is almost always just an asynchronous form of verbal communication. Group communication often takes the form of a slide presentation. Although we like to make fun of PowerPoint, its use is extensive. You can practice your presentation skills by giving status reports to your team with the use of slides. Doing so will help you become familiar with developing an outline and presenting before a group while following that outline.

To improve your individual communication skills, talk with your employees. Ask them about their interests, both inside and outside work; their professional aspirations; and how they feel about the project they are working on. Different factors motivate each individual. Your engineering background will make it possible to quickly understand their professional opinions on technical issues, but, to be a good manager, you must also understand their human side; you must be at ease with feelings. Because your em-

employees are likely to also be engineers and, thus, are probably ill-prepared for verbal communication, the burden of initiating and developing individual communication is yours. You should also encourage communication among team members. Do not make yourself the required channel for all team communication; you are too busy to be always available.

Successful managers are good delegators. As a leading designer, you can probably more efficiently perform the job of some of your direct reports. Taking over is an easy trap to fall into, especially if the project is behind schedule. To be a successful manager, avoid this temptation. You already have two jobs: managing and perfecting your managerial role. If you also design, you will not have time to do one or both of your other tasks, resulting in failure for both you and your team. Your job is to keep your team focused on the goal and to direct members so that they apply their skills in a way that optimizes progress toward the completion of the project.

You may need to become an engineering mentor by suggesting a specific approach to a design problem, or by sharing your experiences in similar circumstances. One effective way to help your employees through difficult engineering tasks is to hold project reviews on a frequent basis, daily if necessary. Companies such as Intel, for example, make design reviews part of the corporate culture. Other companies talk about peer reviews but seldom hold them. Many people feel that both hardware and software engineers resent design reviews as an invasion of privacy. Yet the experience in successful technology companies indicates that the opposite is true.

For design reviews to be productive, they must occur regularly, and the people involved must trust each other. Achieving this environment is the result of good management. If you have a good team that shares success and failures together and does not perceive the design review as a mechanism to identify a "bad engineer," design reviews will improve your team's productivity.

As a team manager, you must protect your team. Your success depends on your

team's success, and your job includes creating an environment that is most conducive to success. When the company assigns a new project, you must make sure that the team has the necessary tools, engineering talent, and time to deliver the product. Politics have gotten a bad name (or maybe they always had one), but they don't have to be devious or ill-intentioned. Politics is the art of fostering your cause while improving the common good. One of your first political exercises will be planning a new project. In this function, you must be a pessimist. You must remember that things will go wrong and that people do get sick, take vacations, and attend meetings. Tired people not only are less productive, but also more likely to make more errors. So, if you think that even in optimum circumstances, your group will need a number of months to complete a project, add 30% to your timing budget for error recovery and 10% for vacations, illnesses, and meetings.

To increase creativity, engineers need the time to step back and look at alternatives. If your agreed-upon schedule is too demanding, your team members will not be creative. Instead, they will reimplement what they already know works and add the fewest new components, and your product will be less competitive. The result will hurt not only you and your team, but also the company: Revenues will be smaller than expected, and the company's market reputation will suffer.

When a project takes months to complete, it is hard to wait until the end to receive a positive feedback. As a manager, you must find ways to reward your team from time to time. You should arrange for social relief—a pizza party, for example. Celebrate reaching a milestone

by taking a long lunch and letting off some steam. Such events are good not only for your team, but also for you. They'll allow you to get to know your people better, observe how they interact, and even learn what corporate issues worry them the most. And the team will work longer hours without being asked. In time, the managerial process will become second nature. The degree of your success as a manager will depend on the length of your learning process. □

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