Guide your engineers to self-rule, advises this leader, who says subordinate-made decisions help him. His challenges? Hiring, pairing people/assignments, managing creative EEs.

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"People-awareness." I think those are the two most important buzz words for an engineering manager to remember, because he works with people instead of things. Unlike things, however, people are unpredictable; they're going to make irrational decisions; they're going to be temperamental; they're going to respond in human ways. I respect my people and try to help them, rather than dictate to them, because I realize that each has ideas that can help the project. My ability to work with people was probably the most important factor contributing to my promotion.

I developed this ability as an engineer when I learned to interface with technical personnel in the lab. When my job called for me to work with a variety of disciplines outside of engineering, I tried to learn their terminology and thought patterns, so I could communicate with them.

An awareness of people comes down to this: People have their own ideas about how a job should be done. If I can make my people believe that I really care about them and that I really want to hear their ideas, then I'm going to be more effective as a manager.

When you ask engineers for 110% of their capacity and 120% of their knowledge on a project, they realize that they're going to have to learn something new before they can complete the job.

When I want my engineers to do a job a certain way, I don't tell them that this is the way it ought to be done; I want them to decide for themselves, because I'm not always right. If they go through the thought process themselves, they may discover something wrong or they may suggest a better way to do it.

I try to motivate my staff to do a good job the first time, so I don't have to do it myself. Every time I try to do a little engineering myself, the details get lost, because I'm also busy with the managing function.

The most frustrating experience I ever had in this regard was when I supervised system tests for Honeywell's 1200-2200 series machines. I had 45 people on a three-shift basis. It was a good experience for me, because it was a job that I couldn't possibly do by myself. I didn't know the products well enough to test them myself. To be successful I had to work with people.

So now I've learned to develop a group that runs with a minimum of supervision, one that is capable of doing the project their way. I build them up, so they can have confidence in themselves. When they realize that I also have confidence in them, they feel qualified to make decisions on their own. This frees me from the petty details of managing, so I can oversee the entire project with more objectivity.

When I give my people a project, I tell them I want 110% of their capacity and 120% of their knowledge. That stretches them, and I tell them so. When I lay out the job, I make it clear that I don't think they're capable of doing the job right now; that they have to learn something to complete it. I say: "It's going to tax you and put a strain on you, but you'll have to learn something new to be successful." My guys like that, and they go after it.

It's very difficult to manage creative people in a world full of schedules, budgets and products that have to be sold. Creative engineers are more concerned with the product design than they are with schedules and costs. I try to get my creative people to stop improving the design and start manufacturing it. The design could be improved forever and never become a product. I instill in these designers the idea that an almost perfect product is better than no product at all. They must understand that although the product isn't perfect, it has met the goals that were set for it.

A designer should carry a product from its design through the manufacturing cycle, where he learns about the real world. When he discovers all the other factors that go into producing a product, he'll begin to realize that the extra 2% improvement that he could have made in the product is really negligible in the total picture of its production.

Then, too, there are those creative types who are withdrawn because their ideas have been stepped on. I try to stimulate them to present

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Experience: Engineering manager; computer test engineering; systems test; instrumentation design; tool and die making; electronic sub-assembly; production, field and operations engineering; and planning.

Best Achievement: Developed the PDP-11 16-bit computer family of digital equipment. Required interface of management with creative design to high-volume manufacturing.

Papers, Symposia: "A New Architecture for Minicomputers—the DEC PDP-11"; Infotec symposium on small computers—London, Sept. 1971.

Personal: Married; three children; interests include antiques; carpentry; photography; sailing.

Employer: Digital Equipment Corp., Maynard, Mass. Founded in 1957 in a converted textile mill by three employees who built/tested manufacturers' computers with a circuit module. Today, with 6800 employees worldwide, and net sales of $146.8-million in fiscal 1971, DEC produces digital test systems, computers, peripherals, and converters, as well as circuit modules.
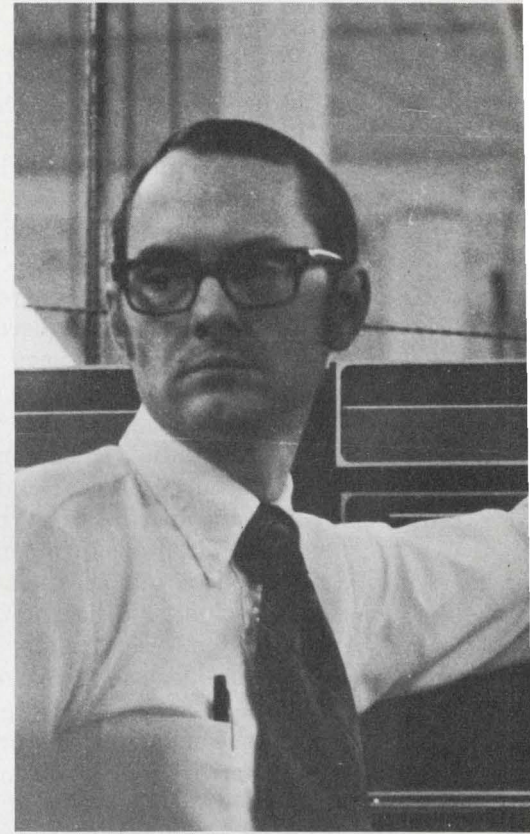
their ideas and then guide them into a realization of why an idea may be a bad one. "Here's my thinking on it," I tell them. Or: "Let's compare the alternative to it." Often the engineer doesn't have the right approach to the problem. He needs to be guided, not led—and certainly not forced.

Win friends, influence people and hire a select staff by asking each job-hungry engineer: "What makes you think you're so good?"

Hiring people is one of the manager's most difficult responsibilities. I can rationalize shortcomings in personnel when I inherit a crew. But to gather the kind of staff I've been talking about, I have to determine if the prospect can do the job.

I like to hire engineers who are generalists rather than specialists, because my work is rather broadbased and I need guys with flexibility. I like a man who's aware, who walks into the plant and asks questions that are not necessarily engineering oriented. If he comments on the construction of our 100 year old building, for example, he may also be the type who'll be aware of the manufacturer's problems.

I try to ask a job prospect a wide variety of questions, including a half dozen or so one-liners —like, "What makes you think you're so good?" That kind of question gives me a chance to see how he reacts to an abrupt subject change.

"What's the most important thing you've ever done in your life?" is another that's designed to lay open his inner feelings. The trick is getting him a bit off balance, so he starts replying naturally rather than how he thinks I want him to reply. For information on his engineering ability, I find out what his specific project function has been, and why he has or has not been successful.

My most difficult challenge after I've hired my people is assigning them to projects and setting goals for the projects. I tend to pattern things after what I think I can do. The trouble is that some people may not have the experience I have.

So I try to understand each person's capabilities and limitations, so I can align him with an assignment he can complete. When I talk about that 110% of capacity, I have to know if he can grow that extra 10%. I never assign a man to a job he doesn't feel he can do. If he doesn't think he'll be successful, he won't be.

When you first become a manager, I think you have to let your engineers do a lot of goal setting. Then closely monitor them until you find out if they can do more or less than they think they can do. Then adjust their load. First, set some short-term goals. Then set the long-term goals. Initially set the goal for the next three months or less, not for the next year. Goals must be set jointly between manager and engineer.

Complicating the problem of goal-setting is the constantly changing industry I'm in—the computer industry. If a product design takes longer than four weeks to develop, you'll find half a dozen more new integrated circuits available on the market, half of which could be used to improve the design.

A broad experience will give the engineer a breadth of knowledge of a product's function that no engineering spec could ever equal.

Broad experience is another major factor that contributed to my promotion. I was fortunate to attend a cooperative educational program at Northwestern University. I worked for two different companies through that program and got a broad base of experience, a feel for things beyond the textbook. The experience included field work and planning at Commonwealth Edison in Chicago and time in a machine shop, where I got a working knowledge of milling, grinding, injection and die casting.

It's a five-year engineering course for a bachelor's degree under the Northwestern cooperative program. The first year is a normal freshman engineering course. Starting with the sophomore year, I spent school time on a quarterly basis— two quarters in school and two quarters in industry, alternating every three months. I was paid and received credit toward graduation. The course gave me a worldly experience with some control, because I worked my own schedules.

One thing I did to broaden my experience wherever I studied or worked was to figure out how the assembly I had to build fit into the finished product. If it was a photo detector that was to be used on a card reader, for example, I made it my business to find out also how the card reader worked. Then I knew how the item needed to be functionally tested without relying just on the specs. You can rarely write specs that tell you the test that would be optimum from a functional standpoint.

And what is my most difficult problem of the future? As I look ahead, I imagine my function will become less and less technical. I'll get into the business function—marketing, finance, etc.— and that's a problem, because I'm an engineer first. I've got to realize that one day I'll be directing engineering managers, one level back from the design problems. If I can get the engineer to solve his own problems, the better able I'll be to direct him from another level.

Too many people want to become managers when they think they don't have it technically. It's ironic, because a good engineering manager must be a good technical man. He must also have knowledge about all aspects of a project. I've kept abreast of the state of the art and spent time in the field. I'm a firm believer in the idea that the more you learn, the further you'll get. ■■