The Unwritten Laws of Engineering

Part 3 of 3:

PROFESSIONAL AND PERSONAL CONSIDERATIONS
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A number of empirical studies of job excellence have clearly and repeatedly established that emotional competencies—communication, interpersonal skills, self-control, motivation, pride in accomplishments, adaptability, integrity, and so on—are much more important for superior job performance than are cognitive and technical abilities. Daniel Goleman, in his book, Working With Emotional Intelligence, cites his own and others’ studies that prove this. Summarizing one such study, he writes: "Emotional competencies were twice as important in contributing to excellence as were pure intellect and expertise." Yet most of the emphasis in the education and training of engineers is placed upon purely technical education.

This is not to suggest that native intelligence, academic training, technical knowledge, and circumstantial expertise are not valuable. They are; only engineers with engineering training and engineering expertise are equipped to perform engineering tasks reliably. But for the most part, engineers are adequately capable in these areas. If not, they almost certainly would have been discharged from the system, either by themselves or by others, long before they became employed as engineers.

It should be obvious enough that a highly trained technical expert with a good character and personality is more valuable as an employee—and probably a better engineer for it—than a sociological freak or misfit with the same technical training. One can rarely accomplish anything worthwhile without the voluntary cooperation of one’s associates, and the quantity and quality of this cooperation is determined by “personality factors” as much as anything. Along with this need for one-on-one cooperation, facility with “soft” characteristics—everything from understanding contemporary society to following ethical behavior—can benefit you and your employer far beyond ordinary technical contributions.

The following personal and professional “laws” are drawn up from the purely practical point of view. As in the two preceding articles, the selections are limited to rules that are frequently violated, with unfortunate results, however obvious or stale they may appear.

{ LAWS OF CHARACTER AND PERSONALITY }

One of the most valuable personal traits is the ability to get along with all kinds of people.

This comprehensive quality defines the prime requisite of personality in any human organization. No doubt this ability can be achieved by various formulas, although it is based mostly upon general, good-natured friendliness, together with consistent observance of the “Golden Rule.” The following “dos and don’ts” are more specific elements of a winning formula:

(1) Cultivate the ability to appreciate the good qualities, rather than dislike the shortcomings, of each individual.

(2) Do not give vent to impatience and annoyance on slight provocation. Some offensive individuals seem to develop a striking capacity for becoming annoyed, which they indulge with little or no restraint.

(3) Do not harbor grudges after disagreements involving honest differences of opinion. Keep your arguments objective and leave personalities out of it. Never foster enemies, for as E.B. White put it: “One of the most time-consuming things is to have an
(4) Form the habit of considering the feelings and interests of others.

(5) Do not become unduly preoccupied with your own selfish interests. When you look out for Number One first, your associates will be disinclined to look out for you, because they know you are already doing that. This applies to the matter of credit for accomplishments. But you need not fear being overlooked; about the only way to lose credit for a creditable job is to grab for it too avidly.

(6) Make it a rule to help the other person whenever an opportunity arises. Even if you are mean spirited enough to derive no personal satisfaction from accommodating others, it’s a good investment. The business world demands and expects cooperation and teamwork among the members of an organization.

(7) Be particularly careful to be fair on all occasions. This means a good deal more than just fair upon demand. All of us are frequently unfair, unintentionally, simply because we do not consider other points of view to ensure that the interests of others are fairly protected. For example, we are often too quick to unjustly criticize another for failing on an assignment when the real fault lies with the manager who failed to provide the tools to do the job. Most important, whenever you enjoy a natural advantage or hold a position from which you could seriously mistreat someone, you must “lean over backwards” to be fair and square.

(8) Do not take yourself or your work too seriously. A sense of humor, under reasonable control, is much more becoming than a chronically sour deadpan, a perpetual air of tedious seriousness, or a pompous righteousness. It is much better for your blood pressure, and for the morale of the office, to laugh off an awkward situation now and then than to maintain a tense, tragic atmosphere whenever matters take an embarrassing turn. Of course, a serious matter should be taken seriously, but preserving an oppressively heavy and funereal atmosphere does more harm than good.

(9) Put yourself out just a little to be genuinely cordial in greeting people. True cordiality is, of course, spontaneous and should never be affected, but neither should it be inhibited. We all know people who invariably pass us in the hall or encounter us elsewhere without a shadow of recognition. Whether this is due to inhibition or preoccupation, we cannot help thinking that such unsociable chumps would not be missed much if we just didn’t see them. Like anything else, this can be overdone, but most engineers can safely promote more cordiality in themselves.

(10) Give people the benefit of the doubt, especially when you can afford to do so. Mutual distrust and suspicion generate a great deal of unnecessary friction. These are derived chiefly from misunderstandings, pure ignorance, or ungenerously assuming that people are guilty until proven innocent. You will get much better cooperation from others if you assume that they are just as intelligent, reasonable, and decent as you are, even when you know they are not (although setting the odds of that are tricky indeed).

Never underestimate the extent of your professional responsibility and personal liability.

Upon becoming a member of the engineering profession, you accepted the responsibility of a professional, as well as any liability that accompanies that responsibility. Many engineers pretend that they can hide behind their employer’s or their department’s shield, or that they are powerless, mere cogs in the machinery, especially if something goes haywire. Although environmental and consumer safety concerns are every employee’s responsibility, engineers are uniquely positioned with the power and knowledge to create, identify, avoid, and correct such problems—an incongruous reality. Regardless of the size of your employer, never forget that you contribute to making decisions, whether the results are good, bad, or catastrophic.

But you needn’t be unreasonably anxious; you are in your position presumably because you can, with your engineering training, knowledge, and experience, identify and judge the risks inherent in your business. In this regard you will serve yourself, your employer, and your profession well if you follow a few simple guidelines:

- Approach all of your engineering systematically, especially when developing new products, processes, or equipment.
- Identify and apply the requisite expertise to all engineering activities.
- Be aware of and use applicable codes and standards.
- Use established procedures for design reviews and failure analyses.
- Keep records of your own and your department’s engineering activities.

Charles Fleddermann, a professor of electrical and computer engineering at the University of New Mexico and author of the text, Engineering Ethics, added another tip for engineers concerned about liability: “One of your jobs ... is to think like a total idiot and
figure out, ‘How is this product going to be misused.’ Don’t just think about how it will be used. Try to anticipate [its misuse] to the extent possible.” Fleddermann said this requires a great deal of creativity, and he often assigns this as an exercise in his design classes. “They have a blast trying to figure out all of the crazy things that can happen.”

According to Fleddermann, even if you meet all applicable standards, codes, and laws, you can still be liable for not conforming to accepted engineering practice. “A lot of people feel that if you do everything by the book, that’s the end of your liability and responsibility.” Fleddermann acknowledged that the term “accepted engineering practice” can be vague, but said, “You are responsible for knowing what that means.”

Knowing what it means involves a great deal of networking, like attending conferences and talking with other engineers to find out what they do—basically, staying current in your field. Unfortunately, much of this information will be proprietary, Fleddermann said, but added, “Fortunately, I think, there is a culture in many disciplines in engineering of sharing at least safety-type information, so that product designs will be safe.”

**Let ethical behavior govern your actions and those of your company.**

Despite the usual ambiguities and everyday quandaries of engineering, ethical behavior usually comes naturally to engineers. Societal values—the basis for ethics—are positively ingrained into most of us. Nevertheless, Fleddermann writes in his book: “Many times, the ethical problems encountered in engineering practice are very complex and involve conflicting ethical principles.” Fleddermann cites the Ford Pinto’s exploding gas tanks and the Space Shuttle *Challenger*’s failed solid booster joint as examples fraught with conflict and uncertainty.

Engineers need the courage of their convictions, including the courage to do what they know to be right without undue fear of criticism and without the need to explain their actions. If the reasons for your actions are sound, you should not worry about having to defend them to anyone. At the same time, you are ill-advised to martyr yourself for every controversial matter in which you strongly believe.

Martin Luther King, Jr. said: “If a man hasn’t discovered something that he will die for, he isn’t fit to live.” True enough, but Oscar Wilde said: “A thing is not necessarily true because a man dies for it.” Martyrdom only rarely makes heroes, and in the business world, heroes and martyrs alike often find themselves unemployed.

All of which, Fleddermann explained, suggests that engineers could benefit from ethics training: “It’s very valuable for you to have thought about these things before you’re confronted. You don’t want to find yourself in an [ethically challenging] situation, and you have no clue what to do about it, and you don’t know what the [available] resources are. Sometimes you don’t even know that you’re in a situation that you shouldn’t be in.” So, ethics training, however you can get it and however much or little you get, is a necessary step toward recognizing and dealing with circumstances akin to Space Shuttle and Pinto disasters.

According to Fleddermann, among the most visible current topics that engineers must address are sustainable engineering and the globalization of the profession. “When you think about it, sustainability is actually an ethical issue,” he said. “Not only do we have to be aware of ethical issues and the way things are done in our own country, but we also have to be aware of how things are done in other countries.” As a vivid example of both issues, Fleddermann cited the post-disaster rebuilding of Haiti after January’s earthquake. “What is an engineer’s responsibility in terms of designing buildings in a place such as Haiti, where we all acknowledge that there’s not a ton of money?” Fleddermann asked. “And yet,” he said, “the risks are huge. I think that is a big ethical issue—how engineers respond in the future [to similar disasters].”

**{ REGARDING BEHAVIOR IN THE WORKPLACE }**

*Be aware of the effect that your personal appearance and behavior have on others and, in turn, on you.*

Permissiveness and dress codes aside, your appearance probably has a far greater influence on how you are viewed by those around you than you could ever imagine. Bear this in mind when you define and present your workplace image. Three rules of thumb will serve you well in this regard:

- Look at how those in the positions to which you aspire are dressed and groomed, then follow their lead.
- Dress appropriately for the occasion. When in doubt, slightly overdressing is prudent; being noticeably underdressed, for most people, is unbearably uncomfortable.
- Conservative clothing and grooming will never be wrong, at least in most engineering circles.
Despite the wide range of acceptable personal appearance found in our society, these common-sense points are hard to argue against in a professional workplace:

- Clothing, regardless of style, should be clean, well-fitting, and in good condition.
- Hair and nails should be clean and well-kept, again regardless of style.
- Your good personal hygiene will be appreciated by your colleagues.
- Perfumes and colognes should be used sparingly, if at all, in the workplace.
- Men should pay particular attention to shaving habits, beards, and mustaches. Others notice poor upkeep, even if you don’t.

Of course, we all know some very good engineers who are oblivious to such details; you can be sure that their apathy has been noticed. We all know some “wild” ones, who also must accept others’ estimation of their image.

Sharon Armstrong, author of *The Essential HR Handbook: A Quick and Handy Resource for Any Manager or HR Professional*, likened our appearance and behavior, in today’s parlance, to branding. “What type of image are we creating when we dress and go to work a certain way versus another way?” According to Armstrong, our brand is more than how we dress: “It’s everything from work product, to appearance, to attitude, to collegiality...all those factors really go into your brand.” Armstrong, a Washington, D.C., human resources consultant and trainer, summed up this unwritten law by saying, “It’s being conscious of the impression you are leaving. That’s the key.”

*Beware of what you commit to writing and of who will read it.*

Be careful about who gets copies of your letters, memos, and messages, in whatever form or medium they are created, especially when the interests of other departments are involved. Engineers have been known to broadcast memoranda containing damaging or embarrassing statements. It is sometimes difficult to recognize the “dynamite” in these documents, but they are apt to cause trouble if they step too heavily into another domain or reveal serious shortcomings in others. If a document is distributed widely or concerns manufacturing or customer difficulties, you’d better get a higher authority to review it.

Once you have issued something in writing, despite your best attempts to the contrary, you will have relinquished control over it. To be safe, assume (1) that your documents might go to anyone and (2) that they will exist forever. Compose them accordingly.

Misplaced verbal assaults cause enough mischief, but putting emotional outbursts into writing is the worst conduct in this regard. Anger, malice, disrespect, and ridicule expressed in written documents toward another will be remembered long after you might wish they had been forgotten.

{ REGARDING CAREER AND PERSONAL DEVELOPMENT }

*Analyze yourself and your subordinates.*

Engineers and engineering managers need not be students of psychology—most are disinclined anyway. Nevertheless, it is enlightening to appreciate that people, including yourself, behave as they do not so much because they want to behave that way, but because that is how they are. Fundamentally, people see and react to things, and judge and decide things quite differently from one another. Even without fully understanding different personality types, simply recognizing that people are remarkably different will help you accept different personalities as normal, and not to view them as somehow wrong. A self-assessment using the Myers-Briggs Type Indicator is a recommended start for everyone.

Among the most important decisions for engineers to make about both themselves and their subordinates is when and how much managerial and administrative responsibility is appropriate. All too often increased executive and administrative responsibility is used to reward outstanding proficiency in any type of work. But this may be a mistake from either of two considerations:

1. People are sometimes surprised to find that they are much less happy in a new, higher level job. Engineers or scientists usually discover, sometimes to their dismay, that once they become managers they no longer have time to be engineers or scientists.
2. By no means does it follow that a good engineer will make a good manager. Many top notch technologists have been promoted to administrative positions much to their own and their employer’s detriment.
These possible outcomes should therefore be considered carefully by the person threatened with promotion and by the person about to do the promoting.

Although certain personality types are more disposed to become managers in their careers, no personality characteristic precludes someone from managerial success. In reality, nobody successfully moving through an engineering career can avoid management and administration altogether. These are necessary parts of all job descriptions and a certain amount of managing projects and supervising others is satisfying for all but the most narrow-minded technologist. Further, as time goes by, many engineers find their interest in management changing, often increasing as their careers mature.

Douglass Wilde, emeritus professor of mechanical engineering at Stanford University, offered additional insight into the value of analyzing for personality in the workplace in his recent article, “Personalities Into Teams” (Mechanical Engineering, February 2010). According to the article, along with the pure technical expertise, people bring distinct personalities with correspondingly different ways of approaching and solving problems. The result is that “the application of those traits can be as important as combined technical knowledge to a team’s success.”

Wilde, author of *Teamology: The Construction and Organization of Effective Teams*, studied the effects of applying Jungian psychological theory (e.g. Myers-Briggs Type Indicators) to student design teams at Stanford University. The data clearly show that psychologically diverse teams perform better in the long run, despite an initial delay in effective communication and cooperation. “Such psychologically diverse teams carry out projects better because they have the full range of problem-solving approaches,” Wilde said.

But industry cannot often mix and match team members for best effect; managers have who they have. For these situations, Wilde describes a “psychological organization meeting” during which the team maps itself psychologically, making sure that valuable cognitive modes are not overlooked. This can, for example, “draw attention to the quieter introverted modes of knowledge, imagination, analysis, and evaluation too often overshadowed by extraverted modes of experiment, ideation, organization, and community.”

*Maintain your employability as well as that of your subordinates.*

It is the rare engineer who has a single employer for a whole career. So if your skills and knowledge are valuable only to your current employer, however invaluable they might seem, you are in trouble. Sooner or later, for one reason or another, your employer will no longer want to buy those skills, and you will have no place else to sell them.

Formal training—university classes, seminars, short courses, company sponsored training—are a necessary part of a life long employability plan. But your plan must also include more than a passing interest in your field by reading sales literature, trade magazines, and professional publications, and attending trade shows and professional conferences. All of this may well require sacrificing personal time and personal finances as well. Simply put, employers do not accept the full burden of employees’ continuing education. The effort and dedication required to remain employable is in every engineer’s best interest.

The author of *Engineer’s Guide to Lifelong Employability*, Jean Eason, confirmed the need for an aggressive attitude toward employability: “For engineers staying with one employer, on-the-job training, reading trade publications, and attending conferences might be sufficient. For engineers looking to change employers, I find that engineers need the more formal training of degree or certification programs.”

According to Eason, recipient of IEEE’s Robert S. Walleigh Distinguished Contributions to Engineering Professionalism Award, engineers must compete for jobs with other engineers throughout their industry and throughout the world. Eason said that, if they need the same training, new grads are cheaper for employers than older engineers; and with advances in information and communication technology, geography doesn’t matter. So overseas engineers might be cheaper still. Eason summed up every engineers’ employability predicament by saying, “If you are going to stay employed, you need to do more than just ‘keep up.’”

The foregoing laws represent only part of the formula for a successful engineering career. However much natural interest you take in these principles—and each person has his or her own level—it will pay for you to contemplate at least a little of the “rules of the game.”

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**Ethical Fundamentals**

ASME has published a “Code of Ethics of Engineers,” designated 15.7 among the society’s policies. It can be found on the ASME Web site at www.asme.org/Governance/Nominating/Society_Policies.cfm.

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