An Introduction To The Early Career Years Of An Electrical Engineer In Industry

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"Graduation! No more studying, exams, professors. Now I can go out, put my knowledge to work, and earn some money!" In general, engineering students often entertain similar thoughts toward the end of their senior year. Some graduates expect to take advanced courses later on, or perhaps go back to graduate school full time. But if they are looking for a job, many expect to put their schooling behind them for some time. Once the engineering student enters the real engineering world, he finds that graduation is not the "Great Escape." On the job, the former student finds himself right back in a learning situation. He or she still has lab work, homework, discovers that his supervisor functions like a teacher, and the new engineer may even be directed to attend formal classroom sessions by his company. In the world of employment, evaluations are substituted for exams, and grades are replaced by salary increases and promotions. This return to organized instruction is less irritating when the former student remembers that his schooling prepared him with general skills for engineering work. Now the young engineer in training for a specific project requires months of study and application before doing productive work.

Also, now that school is out the engineering graduate looks forward to working regular hours, and to having more time for pleasure. Generally this is true, but an engineer should be prepared for working overtime, and occasionally taking home some problems for quiet study.

While on the job, the former student must absorb a great deal of information about techniques, situations, and personnel in industry. Some of this information is presented in the following sketch of the first years in a typical engineer's career.

Preparing a resume' is one of the first experiences the graduate encounters in his career. It is a capsule summary of achievements and future expectations. He should realize while preparing this document that it not only represents him to a prospective employer, but also has the same importance as choosing a major field in college. One often gets what one asks for. If uncertain what specific field he wants, he prepares a resume' showing general goals. Work may be assigned on anything from motors and generators to computers. However, he may be interested in a specific area such as communications and want to specilize in digital circuit design. The resume' should clearly reflect those interests.

Once hired the former student will probably be assigned to an experienced engineer in an apprentice situation. For maybe six months, teacher will pacify the pupil until confident the student has learned enough to survive small tasks on his own. The freshman has become a sophomore, but it will be a few years before he becomes a junior.

At this point in time, the new engineer discovers an important difference between his school work and career work. In school, the student worked basically as an individual, occasionally getting together with other students to work homework problems, or prepare for an exam. However, for the most part he was on his own. It is probable he, or she, will now become part of a team, which often is a very plesant experience. As part of a team there is generally someone available to help solve problems, check out designs, offer constructive criticism, or provide answers. The new engineer shouldn't feel that he alone is responsible for decisions. However the team provides problems as well as security. Today's professional engineer must be socially adept. "People" problems often are as important to solve as design problems. Although the student probably has taken courses in social behavior, etc, it is to the student's advantage to prepare for working closely with others by active participation in clubs and extra-curricular activities while in school.

Once the neophyte has worked on a few projects, he can develop frustration over a situation inherent in most engineering environments. Except in small companies, one seldom has the opportunity to remain on a project from start to completion. Many engineers prefer to follow their designs into production; to see the product built and to see the product in use. An engineer can think of himself philosophically as similar to the artist Leonardo da Vinci, who left many of his paintings unfinished. Da Vinci often considered his work completed once the design problems were solved.

The fortunate student will be assigned to work on a proposal early in his career. The proposal is the formal way a company invites new business, or responds to a customer's invitation to bid on a new product. The proposal team is a group of engineers who develop a clear discription of the potential product, and present the data in a language that the potential customer can understand. The student who considered English and writing courses a waste of time may find himself deficient in valuable skills. The proposal should reflect the company's engineering competence, telling how the product can be built, what it should cost, etc.

In proposal work, the engineer often works with vendors who supply price and technical information about the parts and materials the engineer expects to need. The vendors are technical salesmen, and the new engineer should learn quickly that each vendor's sales promotion is based on an assumption that his line is best.

Engineers are often referred to technical representatives if a vendor lacks the specific information that an engineer requires. The tech. rep. represents his company's product and can provide the engineer with greater technical information about the specifications related to the parts in question. He is less sales oriented, but more technically oriented than a vendor.

In some instances the potential customer does not always know exactly what his problems are, or how to define his specific needs. A systems engineer normally works with the customer to pinpoint the specific requirements of the product-to-be. These requirements, in turn, are presented to the design engineer as as design specifications. The design specifications detail requirements such as what stresses the product must withstand, how reliable it must be, etc. Simply, the design specifications are a technical translation of the customer's needs and requirements that can be understood by the contractor and the customer.

Technical consultants are often hired. They are experts in their field, employed when design problems require someone with highly specialized knowledge not available within the company.

Once the technical and cost considerations are resolved, contracts are signed. The contract commits the company to produce the agreed upon product within a certain time. The contract also guarantees that the customer has accepted the proposal, the financing, and the design. The signing of a contract is an important phase to the engineer since it indicates the initial approval of his design.

Once the contract is signed, schedules become important. Schedules are management tools that plan the timing of work on the project so that vendor deliveries, company resources, manufacturing personnel, all mesh. Poor schedules are similar to being out-of-phase in school. In school, one can lose a year waiting for the first level of a course that is required before you can take the higher levels in their proper order. On the job, having to put together a printed circuit board when some parts haven't been delivered, is frequently the fault of poor scheduling.

Therefore, it is obvious that the new engineer acquires valuable practical knowledge of the company's internal working groups and techniques when he stays with a project beyond the proposal stages.

Within a company, engineering must work hand-in-hand with the financial groups. There are basic financial techniques used by most companies. Budgeting is the basic financial tool used to plan expenditures months in advance. Intelligent budgeting forces forsight in the allocation of resources and examines how maximum profit is achieved by the best application of available capital. Once a budget is firm, the company designated monies and other resources are assigned (funded) to the accepted plan. Cost analysis, a function of budgeting, is simply comparing the actual cost with previous job estimates and forms a feedback loop to control project expenditures.

With financing resolved, the design engineer, guided by the systems engineer's specifications, and management schedules, works with the manufacturing group to provide technical documentation consisting of parts, processes, and procedures to build the product. Normally the engineer has technicians assigned to him to build prototype engineering models of his desgins. The prototypes are used for testing to prove that the design equipment actually functions as expected. Once the prototype is refined and final engineering documentation is available, manufacturing is supplied with drawings necessary to build the equipment. This group is responsible for tooling up for mass production, within established budget limitations. They interface with many functional groups, among which are finance, marketing, and engineering. They must make the engineer's design work in practice, and in large volume, as material, labor, and company resources are committed to yield the desired goods and services.

The apprentice engineer may have trouble differentiating between sales and marketing within his company. It helps to remember that sales personnel solicit new business. Their reports and information reflect the potential customer and the needs of the associated industries. Market analysis, however, objectively considers the longer range picture and developes projections from a few months to several years in the future. One objective of marketing is to integrate products and development so that each reinforces the other in a way that transcends the individual goals of either. Management uses marketing information for planning and guiding the careers of apprentice engineers towards the technology and market place of the future.

In time, the new engineer becomes familar with the company hierarchy, or chain-of-command. He learns who makes the company decisions and guidelines. These policies often differ, not only from one company to another, but from one department to another within a company. Often rules may seem inappropriate to a new engineer. The engineer should not make snap judgements, but be willing to wait a considerable time to see the rules in use before making a judgement. Often the perspective of an inexperienced engineer may be too limited at first to understand the full context of a policy he initially dislikes.

As the engineer's "sophomore apprenticeship" draws to an end, he should begin to outline a long range career plan. Actually the career outline should have been started before graduation. The student's resume', reflecting many career goals is part of the career plan. The revised outline should now include future education, professional status, technical or management considerations, as well as personal plans like marriage, family, purchasing a home, geographic desires, etc. After all the major elements of his future are listed, he needs to try to integrate them into a complimentary and homogeneous strategy.

A simple analogy to this career plan is the course outline a well-prepared instructor follows to keep his class from wandering or becoming bogged down. The instructor doesn't follow the prepared outline religiously, he uses it only as a guide. Courses taught without planning can drift aimlessly and become boring. This condition can happen to a person's life and career. During the early years of employment, the engineer must accept responsibility and have the courage to plan an aggressive, meaningful curriculum for himself. He knows he will revise, and change the plan several times during his career.

During the first years on the job, the engineering graduate should become involved in the available engineering societies. This is an excellent way to meet a variety of active engineers, and obtain constructive ideas of how to construct a professional engineering future. An engineer should plan to take the Professional Engineering Exam, (P.E.) as soon as he, or she qualifies (about five years of experience are required.) During the senior year in college, the engineer-to-be should apply for, and take the "Engineer-in-Training" Examination (a test of fundamentals of engineering and science.)

Becoming involved in the Institute of Electrical and Electronics Engineers is recommended. The group meetings, technical magazines, and professional attitudes of IEEE add tremendously to an engineer's career.

One of the most important decisions the engineer faces as he plans his career, is having to choose between an engineering technical future or a management technical future. There are advantages to choosing the management route. It is challenging and creative working with people. Today, management offers the best salary, benefits and prestige. In our age of rapid and dynamic change, technology quickly outstrips the engineer, and technical obsolescence seems to set in almost at graduation. Management techniques don't become outdated as quickly. Participation in technical societies is one way to retard technical obsolescence, but it is not the entire answer. However, technical societies are working on the problem. Specifically, IEEE has gone so far as to broaden its basic structure because lay-offs and obsolescence have become a serious problem. Perhaps, in the future the decision will not be as lopsided for a management career over a technical career as it seems to be now. This would be good for society as well as for individual engineers because the engineer who chooses to stay out of management and to remain technical helps to change the world. The engineer must always work in the excitement of the future, not the present. He has the absorbing job of solving problems never solved before. An engineer should see himself as a creative artist; taking both old and new materials and techniques, putting them together in new ways, and putting them to a new use. His work is inovating and challenging for he chooses to work on the threshold of the future.