Engineers in the 21st Century

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Invited Paper

MOST of us choose engineering as a profession because we like to solve problems and build things. I picture an engineer as a whole person, a well-rounded, well-adjusted individual who is capable of conducting business like anyone else, with the added benefit of technical skills. We are the modern day renaissance men and women, like Edison and DaVinci. These men could invent and create. They were artists who had a broad view of the world and saw possibilities that no one had seen before. There is no reason why we can't be like them and do even more. We understand more science and have modern tools like computers and lasers to design and build things, plus we can use information technology to gather data when we have knowledge gaps. The point is that, once we have a clear picture of who we want to be, now more than ever before, that vision is obtainable, and that vision becomes a self-fulfilling prophesy if we choose to act on it. Certainly, if we think we can't do it, we won't.

I'd like to share my vision of an accomplished 21st century engineer and offer some thoughts on how to get there. I see successful engineers as people who take an early interest in science and engineering. They have alert minds and a natural curiosity for everything around them. Their drive to learn is insatiable, soaking up knowledge constantly. They do things for the love of it, not simply for monetary rewards, but for the pride and personal satisfaction that comes with doing something particularly well. Over time, they develop a clear intuition for excellence that drives them to produce quality in whatever they do. They mix well in society because they also take an interest in people and the dynamics of human interaction. Personally, they are self-confident but not ego-driven and have respect for other human beings. With the broad knowledge base they build over time, they can come up with fantastic ideas for solving just about any kind of problem, and they are able to build marvelous things or great companies by working with other people. The success that naturally goes with all that also makes them highly respected in society. That's the kind of successful individual we can be! And, we can have a profound impact on our community at large.

So what do you do when you're just starting out?

- Develop an interest in learning. Once you become curious about a subject, learning comes naturally. With an attitude of learning, everyone and everything can be your teacher if you let them. People develop incredible insights about their interests and passions, and most are willing to share what they know. You can pick up what they've learned over a lifetime just by listening.
- Build a strong foundation in basic science as well as a broad range of technologies to allow you to come up with creative solutions to problems. This breadth of knowledge helps you become aware of what you don't know and gives you a sense of where to look fora solutions.
- Pick one particular subject area in which to specialize. A Ph.D. dissertation is an invaluable vehicle for learning how to be thorough. The particular topic is not so important because once you know how to dig deeply, you can do so quickly on any subject that interests you.
- Put a high value on your time, and only take on projects for which you have a passion. Being satisfied with "It's just a job" robs you of the real opportunities. Work hard and develop a habit of completing whatever you do. What you learn in solving specific technical or people problems often enables you to tackle even bigger projects.
- Do explicit long-range planning. Decide on what you want to accomplish in life, and look at the trends in your particular area of interest to decide what you need to do to get there. Modify your plans periodically as you gather new information. You are more likely to be your own master and less likely to be reactive to other people's agenda.
- Pay attention to attitude and self-awareness early on. Success is naturally optimized when you make the best use of available resources. Since you are your own most valuable resource, you'll need to understand how you operate in order to apply yourself most effectively. An objective understanding of your own strengths and weaknesses will give you the self-confidence to take on the right project and bring in people with the needed skills that you do not possess.
- Practice building strong relationships because you need other people to help you succeed. Study subjects in liberal arts to understand what make people tick. As you develop an understanding and appreciation for what other people do, you will naturally respect them as individuals. Respect begets respect because reciprocity is the basis of human relationships. Be helpful to people and you'll get plenty in return over time.

The single most important message to remember is that you can figure out how to deal with any person or situation once you have the right mindset. Together with your technical skills, you

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can be the most brilliant scientist and engineer, or migrate to become the most beloved teacher, the best medical doctor, the wisest judge, the most respected business owner, or whomever you choose to be. With your vision as the guiding light for your actions, you will get there. We will be the role model for the brightest and the best to join our ranks. There is no limit to what we engineers can do!

Milton Chang is the Chairman of New Focus, Arcturus Engineering, and OEpic, and Managing Director of iNCUBiC. He earned the B.S. degree in electrical engineering with highest honors from the University of Illinois, and the M.S. and Ph.D. degrees in electrical engineering from the California Institute of Technology. He was President/CEO of Newport and New Focus, and has incubated more than a dozen companies without a single failure. He currently sits on the boards of Agility Communications, Lightwave Electronics, Gadzoox Networks, and OpVista.

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