A Model for Engineering Leadership

Rebalancing Engineering Leadership with Business Leadership

Ikhlaq Sidhu,
Chief Scientist & Founding Director,
Sutardja Center for Entrepreneurship & Technology
IEOR Emerging Area Professor, UC Berkeley

Revised August 2015

Historically, technological innovation has been the central force behind economic growth, national competitiveness, and societal benefit not only for the U.S. [1], but also for other developing and industrialized nations. In light of the recent economic downturn, it is now more important than ever that global firms prioritize seeking out the most effective means to innovate new products, services, production methods, and operational efficiencies.

However, the nature of U.S. leadership has changed in the past century. Until World War 1, the archetypal CEO in the United States was an engineer or inventor with an orientation towards production [2]. Recently, particularly after the development of professionalization of business degrees such as MBAs, we have seen a rebalancing of the skill types of industrial leaders. The 1960's saw the emergence of market- and sales-oriented leaders who could seek out the needs of large markets. In the 1980's, finance-oriented people, adept at valuing firms and increasing the efficiency of the corporate sector through private equity, rose to leadership.

According to *The New Republic*, people more skilled at asset valuation than building products, innovating, and running operations manage most of today's largest U.S. firms. It seems to be a forgotten fact that engineering leaders have traditionally been the backbone of sustainable competitive advantage in the United States as well as throughout the world.

What skills will be required in the next generation of innovation? We postulate that the next generation of competitive gains is likely to come only from leaders with *a unique combination of technical horsepower, entrepreneurial ability, and business judgment.* We still need engineers who are both technical experts as well as leaders. *We believe that to excel in the new economy, we won't need more generalists with common sense; we will need technical specialists with uncommon sense and visionary leadership skills.* We also name the tools and techniques are available to prepare technical audiences for a balanced combination of engineering and leadership.

[1] Technological innovation and economic performance, Benn Steil, David G. Victor, Richard R. Nelson, Council on Foreign Relations
[2] Noam Sheiber, Senior Editor, New Republic, "Upper Mismanagement", 12/18/2009

Leadership balance for a new economy

The new economy is replete with the successes of leaders (engineers and others) who have been willing to get their hands dirty with invention, design, and production. Firms that have stayed true to a balance of engineering perspective in their leadership continue to be shining examples for U.S. innovation and productivity. Consider the global economic and cultural influence of Apple, Google, and so many other Silicon Valley firms that have been started and are currently managed by technically capable leaders. More broadly speaking, we estimate that almost 70% of top 50 best places to work across all sectors in US as listed by *Fortune Magazine's* were started or are now run by technically trained leaders [3].Similar trends can be tracked globally too. Around 75% of the best places to work in Germany as listed by *Great Place to Work* Institute were founded by or are now run by leaders with technical training. Building on a similar list for Japan, India and China by *Great Place to Work*, we found almost 60% of the best companies to work for had technically trained leaders or founders.

According to Coleman Fung, board chair of the Coleman Fung Institute for Engineering Leadership, "The misconception of engineers as worker bees in a global machine does not serve the interest of industry or society; it only constrains our collective potential." This doesn't necessarily mean that all engineers are natural-born leaders, but in the same manner that today's successful financial- and market-oriented leaders require technical capacity, a select subset of engineers have the potential for great industrial and social contribution" [4].

Engineering organizations without a culture of engineering leaders

Today, more than ever, a critical issue for global firms is the competitiveness of their talented technical staff and leading innovators. High performers are promoted within the corporate hierarchy to engineering and technical marketing roles, but many require a rounding-out of their skill sets to function as both engineers and leaders.

The symptoms of "engineering without leadership" include organizational indecision about new products and services, disagreements between product management and engineering, delayed and halted projects, reduced R&D productivity, poor technology strategies, team morale and retention issues, and overall poor competitive performance.

Our experience in leadership development was forged from an initial focus in entrepreneurship education for engineers and scientists. For about a decade, we witnessed an increasing number of universities begin to offer entrepreneurship courses for engineering students. And for many universities, this has been highly effective in achieving of both learning goals as well as career opportunities.

[3] http://money.cnn.com/magazines/fortune/bestcompanies/2010/

[4] Chris Anderson, "The New New Economy: More Startups, Fewer Giants, Infinite Opportunity", 5.22.09; "In the Next Industrial Revolution, Atoms are the New Bits", 1.25.10, Wired Magazine

Though entrepreneurship is important, we have more recently begun to see that the ability to begin new initiatives is only part of a larger picture of leadership. Balancing and integrating areas innovation skills, communication skills, and operational skills also play a huge role in furthering leadership.

Transforming an engineer into an engineering leader

The first element of our model is transformation through pedagogy. The second element is integration with active learning projects across a wide category of objectives including innovation, entrepreneurship, operations, strategy, change management, and leadership.

Step 1:
Our primary- and high-level objective of the transformation is to change the scope of the problems worked on by most engineering and scientists.

At the outset, we realize that an engineering mind is typically product- and/or technology-centric. This is understandable, since a passion for technology is almost a prerequisite for becoming a successful engineer or a scientist. However, a broader approach is required to successfully bridge the gap between a technically excellent organization and a commercially successful organization. Thus, an engineer must look beyond the product variables towards the business variables to ameliorate the degree of innovation and effectiveness in a firm. This can be an iterative process, where the effect of either set of variables on each other can be adjusted accordingly. Consequently, the adoption of a holistic approach such as this results in a more effective solution to the larger problem and empowers the engineer with higher degrees of freedom.

Many product decisions are actually business decisions disguised as technical decisions. We consider new business creation to be the search for a new business model, while effective operations depend on measuring the efficiency of a working business model, as popularized by proponents of lean start-up models such as Steve Blank, and extended by our Engineering Leadership Principles [5]. If engineers focus only on product design and process, they are unable to make an impact in the businesses operations. In this respect, the broadening of an engineer's scope to include business design is an important first step in multiplying the effectiveness of innovation and operations within a firm.

[5] 10 Principles of Engineering Leadership, http://ikhlaqsidhu.com/about-2/

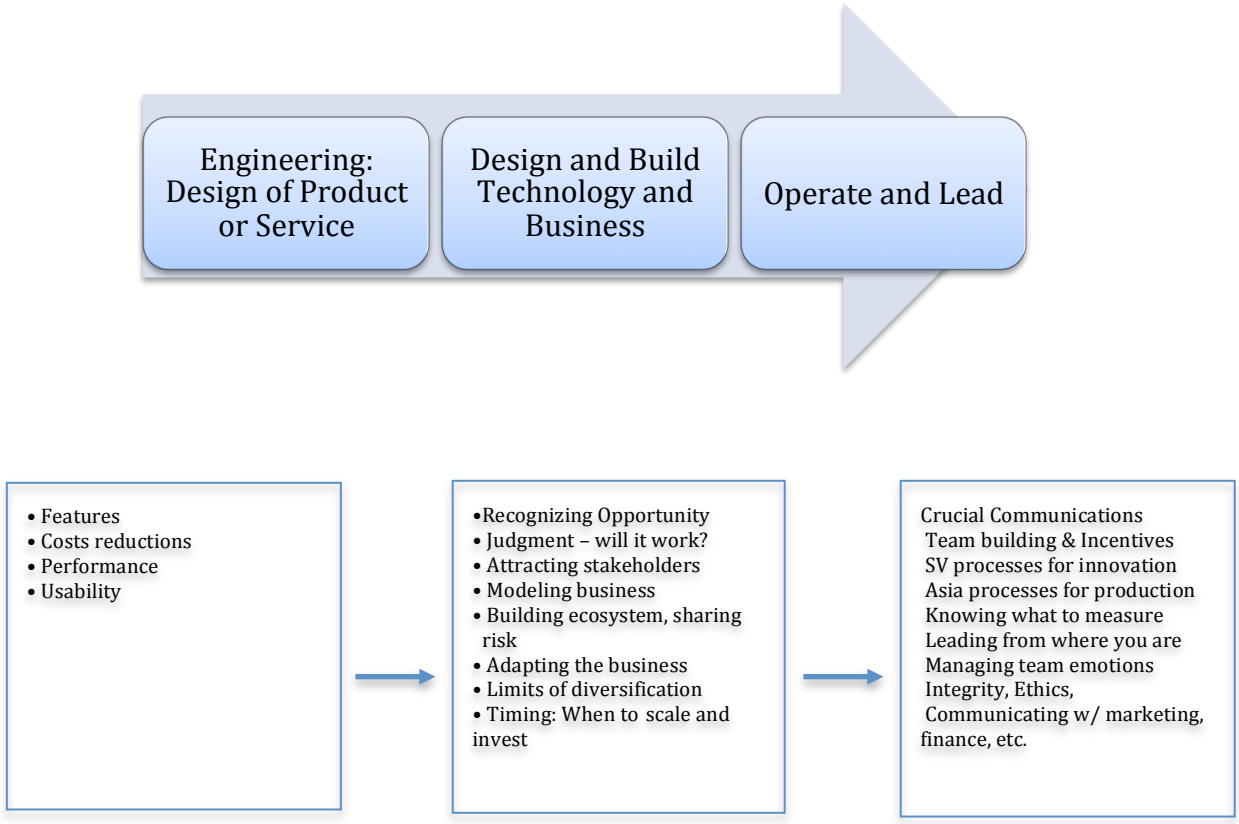

Fig: Step 1 for Transformation of an Engineering Mind

Step 2:

Next, an engineer must focus on refining his or her operational and leadership skills. It is often imperative for an engineering leader to effectively communicate the technical and business aspects of the proposition to the team members. These skills are particularly important during crucial and high stakes conversations involving managers, customers, or subordinates. Aspects of critical communication skills include influence, negotiation, and conflict resolution. While large portions of leadership are executed through communication, we emphasize that that leadership does not come from position or title, but rather, titles tend to come after leadership skills have been demonstrated. Leadership may be demonstrated from any position, and this concept is especially true in engineering organizations.

Thus, in a nutshell, a curriculum to transform an engineering mind must broaden to incorporate business and leadership components to influence the strategy and operations of an organization.

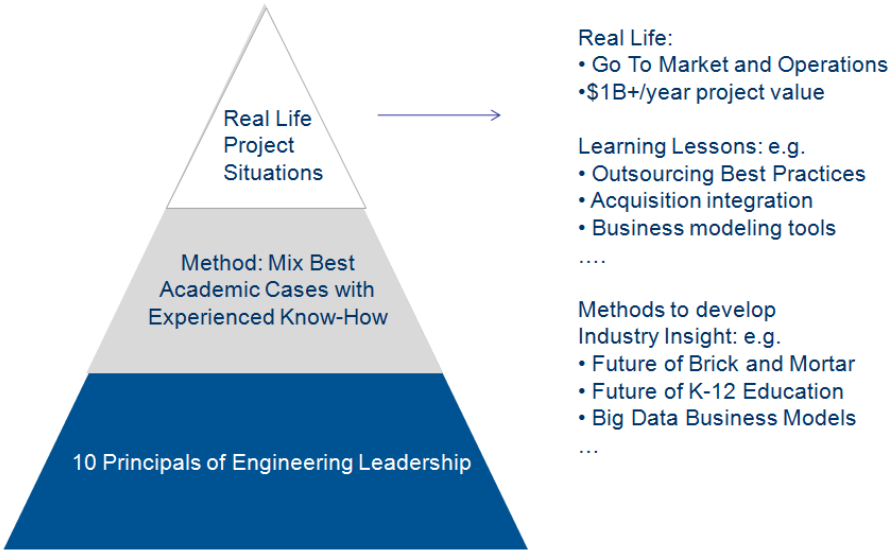

Fig: Step 2 for Transformation of an Engineering Mind

The final element: active learning projects

As part of our framework to develop a global engineering leader, we integrate active learning projects in parallel to transformation steps though a curriculum. Our goal in this component of the framework is to have engineers achieve desired outputs through real life projects. Thus, theories and skills are first taught and then applied to real life situations encompassing technology development, business development and business operations.

Our project framework has returned positive outcomes. For example, Silicon Valley Engineering Leaders within our program typically work on projects cumulatively valued over $1 billion/year. These projects have real world implications for their organizations.

The framework we have developed for Engineering Leadership projects enable new work and new insight in to both 1) best practices in engineering leadership processes as well as 2) new contextual insights into industry changes and future opportunities. Projects of the first category expose engineers to a number of lessons and processes such as outsourcing practices, business modeling tools, and methods of acquisition integration, among others. Projects of the second category focus on the future of various industry sectors as part of the project models as well. A few examples in this regard are **Future of Brick and Mortar**, Future of K-12 education and Big Data Models.

Summary:

Through pedagogy, we have proposed a method to transform the existing engineering mindset into engineering leadership. A summary of the skill transformation is as follows: 1. Better judgment on what technology development shall manifest into business opportunity, 2. Refined communication skills to influence an organization and people, 3. Increased leadership ability to develop high team performance, and 4. Operational and financial skills needed to execute decisions effectively.

Though a systemic project-oriented process, the overall result is professional development of the engineering leader as well creation of a library of engineering leadership insights that can be shared with a global community.