International Conference
on the Roles of Humanities and Social Sciences in Engineering (ICoHSE)

What Makes a Succesful Engineers?

Jamaludin Mohaiadin
Universiti Malaysia Perlis
jmoh@unimap.edu.my

Abstract

One may see an engineer as a person with a university education in engineering who may take an idea and turn it into a useful thing for other people to use. An engineer may make a better mouse trap, or tell people how best to build a bridge or a skyscraper. Whatever things to they wish to do, an engineer is to make sure people are safe and the next is to improve life. They can become very good engineers who can handle tools and machineries. Die-hards and loyal engineers to these perceptions have been losing out in terms of managerial positions, wealth and leadership to those who are enterprising and see business as well as quality management as prime factors to improve life, build better bridges and skyscrapers. In this fast changing world, the expectations towards engineers have changed. Engineers have to leave their cocoon if they wish to be better engineers of today and see the reality of life which is getting more sophisticated and complex. They need skills to manage people, technology, money, physical facilities, time, money and other resources. In addition, they also need to communicate effectively with society and other non-engineering people from various professions. Prestigious universities in the USA have been pushing for changes in their engineering programs. One might wonder why and what's behind the sudden push by universities to produce *people-smart engineers*? Engineers must learn to be leaders not mere followers or just faithful employees of organisations. These skills and knowledge are easily acquired from the humanities and social sciences disciplines and engineers must no longer shy away from it as they can be better engineers, scientists and wealthy business people should they have those value-added qualities.

Introduction

An engineer is defined in many different perspectives and according to the American Heritage Dictionary (http://education.yahoo.com/reference/dictionary/entry/ engineer), an engineer is a person who is trained or professionally engaged in a branch of engineering; one who operates an engine; one who skillfully or shrewdly manages an enterprise. Wikipedia (http://en.wikipedia.org/wiki/Engineer) defines an engineer as a person professionally engaged in a field of engineering. Engineers are concerned with developing economical and safe solutions to practical problems, by applying mathematics and scientific knowledge while considering technical constraints. As such, the work of engineers is the link between perceived needs of society and commercial applications. Some consider this profession to be the link between art and science. However, not many engineers would want to associate themselves with art even though engineering is known to be a work of art and products of engineering is an art by itself.

Since the earlier days, engineering is seen as a tough subject and only those who are excellent in mathematics and science fit into the profession. Having said this, universities screen student for admission on certain basic requirements. Most American universities impose the following criteria.

- Top 15% class rank
- No deficiencies in the State/Regional Standardised Examinations or Tests requirements with:
  - GPA (Grade Point Average) - 3.0
  - SAT (Scholastic Aptitude Test) - 1050 (Math & Critical Reading)
  - ACT (Achievement) Examination – 23
  - GRE (Graduate Record Examination) – 3.0 on 4.0 scale (for certain areas)
- Good grades in Physics, Mathematics, Chemistry and English

Malaysian universities also scrutinize tightly for students entering engineering programs which is similar to other countries with a strong focus on mathematics, physics,

chemistry and other subjects related to engineering disciplines. At the same time, the Board of Engineers, Malaysia (BEM) also impose its accreditation guidelines with the following attributes deemed necessary in preparing for the contemporary engineering practice, i.e., every student should have the:

- ability to apply mathematics, science and engineering science in solving engineering tasks
- ability to understand environmental, economics and community impacts on development
- ability to communicate effectively and ethically in discharging duties.

In 2002, the government of Malaysia agreed on a three-year undergraduate program for all universities. The Institution of Engineers Malaysia (IEM) also agreed to recognise 120 credit hours as the minimum requirement for graduation for those with Sijil Tinggi Pelajaran Malaysia (STPM) qualification, of which 80 credits must be allocated to engineering and its related subjects. Now the policy has changed. A four-year program has been reintroduced and it is still tailored strictly to the engineering majors with little avenue for students to take other value-added disciplines. This is due to the directives from the Ministry of Higher Education that every student regardless of their disciplines must take subjects like Islamic and Asian Civilisation, language requirements, co-curriculum subjects and a few others. Students, on the other hand, are also too naïve to take extra subjects beyond their program requirements for fear of getting lower CGPA or having to graduate a little bit later. Having to confine themselves to just engineering courses and the fear of venturing into other disciplines have effected the quality of students in their ability and skills for job requirements. All in all, industries complained that the students now lack communication skills, leadership qualities and so forth.

The engineers that we have produced

Universities have produced thousands of engineers every year all around the world. According to the All India Council for Technical Education or AICTE (http://www.wes.org/ewenr/07jan/feature.htm), approximately 440,000 students were enrolled in first-level engineering degree programs in 2004-05, 265,000 at the diploma level and 33,000 at the master's level. By comparison, the seven IITs (Institutes of Information Technology) had a total of 25,000 students enrolled at all levels in 2002-03. Figures capturing the annual number of graduating engineers are a little harder to come by; however, a 2005 study by Washington, D.C.-based National Academies estimates that 200,000 students graduate each year from first-level engineering programs across the country (revised from an original estimate of 350,000). A study by researchers at Duke University pegs the number slightly higher at 215,000, but notes that almost half are graduating from three-year diploma programs. By comparison, the National Academies estimates that U.S. institutions graduate 70,000 engineering students annually, while approximately 100,000 students graduate from institutions in the European Union. In China, that number is close to 640,000, of which approximately 350,000 graduate from bachelor programs and 290,000 from short-cycle associate-equivalent programs.

The quantity and quality of graduates have always been questioned by certain quarters. Recently, the quality and performance of our students have been very topical in many discussions at various levels. Some were very satisfied but some would differ in their opinion. If we ponder closely, the deficiencies are not so much on engineering and technical skills, but the soft skills, psychological knowledge of human interaction, leadership and management skills which all fall under humanities and the social sciences domains. These deficiencies obviously can never be rectified if engineering programs are rigidly designed just for the purpose of technical knowledge and skills as had been defined by the Board of Engineers or other accreditation bodies. It is fine to have all those knowledge, but the question now is, how far can engineers go in their profession at managerial level or in business ventures? This is to show that humanities and social sciences have important roles not only in making good engineers, but better engineers.

Humanities and Social Sciences

Engineers most often disregard the importance of humanities due to ignorance or being trained in such a way that this discipline is seen as of lesser quality. Excellent students are streamed into arts and science since in the lower secondary schools and we even see mathematics, sciences and engineering curriculum are divorced from humanities subjects. So, it is not surprised to see why engineers that we produced are socially impaired in communication skills and other soft skills.

The humanities are academic disciplines which study the human condition, using methods that are primarily analytic, critical, or speculative, as distinguished from the mainly empirical approaches of the natural and social sciences. Examples of the disciplines related to humanities are ancient and modern languages, literature, history, philosophy, religion, visual and performing arts (including music). Additional subjects sometimes included in the humanities are anthropology, area studies, communications and cultural studies, although these are often regarded as social sciences. Humanities is seen also as self-reflective, i.e., a self-reflection that helps develop personal consciousness or an active sense of civic duty. It has been central to the justification of humanistic study since the end of the nineteenth century. As engineering is always concerned with developing economical and safe solutions to practical problems and the link between perceived needs of society and commercial applications, it is therefore utmost important that they be analytical, critical and speculative in their work and the innovations that they wish to works on. Thus, I don’t see why engineering programs designed by universities must be so isolated from humanities.

Social sciences, on the other hand, comprise academic disciplines concerned with the study of the social life of human groups and individuals including anthropology, communication studies, criminology, economics, geography, history, political science, psychology, social studies, and sociology. Here again it is so much related to the work of engineering because whatever engineers produce, work, invent or develop is for the benefit of mankind and their social well-being.

Significant contributions to the social sciences and engineering were earlier made by Muslim scientists in the Islamic civilization. In engineering, for instance, many buildings and architecture in those days were built to suit the human, social and safety needs. Mathematical expression of philosophical ideals was taken to be symbolic of natural human relationships and the same laws moved physical and spiritual realities to all God given knowledge. Islam is the universal order, the integral religion of harmony, and the unique system that harmonizes the physical with the metaphysical, the rational with the ideal, and the corporeal with the spiritual. In the practice of Islam, engineering, as a God-given knowledge, must be maintained as an intimate connection between science and other fields of Islamic studies. All these ideals and principles are clearly shown it the design and building of Masjid Al-Nabawi, the Taj Mahal, Majid AlAqsa, Masjid Al-Haram and so forth. Having said this, the inter-connection between humanities and social science has always been spiritually pivotal to engineering and other disciplines of pure sciences.

In the current scenario, what have humanities and social sciences contributed to the success of well-known individuals in the world? Who are the successful CEOs and Managing Directors in major organizations of today? Who are these people? Unfortunately, many are not engineers. From the 2008 Forbes AOL Money and Finance Report (http://www.forbes.com/lists/2008/10/billionaires08_Warren-Buffett_C0R3.html) none are engineers, except for Mukesh Ambani who has a degree in Chemical Engineering (see Appendix 1). Even then he did not make his riches because of his engineering degree but inherited from his wealthy family fortune. Out of the 10 richest billionaires, 7 are self-made man and 3 inherited from their family's fortune. These people are shrewd entrepreneurs who build their empires through manufacturing which involves huge multinational engineering companies, but they are not engineers. Surprisingly, they come from the arts disciplines. Of course, there are engineers who became successful, but only those who are skillful in management strategies, leadership, entrepreneurship, economics, finance and engineering communication. In other words, without other additional qualities which can be acquired from the social sciences and humanities, engineers cannot be successful in other fields. Ultimately, they will remain

by just becoming diligent engineers, excellent researchers or inventors and work as employees of those from the arts disciplines.

What other countries are doing to produce better engineers

In the United States, for instance, certain organisation have perceived the quality of engineers to be of lower quality, particularly from Asia. This is seen in a U.S. debate over the number of engineering jobs outsourced to India and China which overlook one key issue, i.e. many graduates of those nations' lesser engineering schools lack the skills to be hired, at home or abroad (Davidson, 2008). This is due to the types of programs, curriculum, facilities and training offered by the universities which may not fulfill the basic requirements for engineering professionals. In India, for instance, some of shortfalls are due to lack of funding. The main source of funding for public universities and colleges comes from the central and state government in the form of grants, with a small percentage comes from fees. Indian education observers frequently note that many higher education institutions are under-funded, especially in the technical sector, where laboratories and classrooms are often under-resourced and understaffed. Another factor is, the booming growth in the number of technical institutions has led to particularly acute issues and concerns for the engineering sector, where colleges are struggling to hire adequately qualified faculty, graduates are failing to find employment and regulators are under pressure to improve standards.

Due to this, one may think everything is well in the United States of America. Recent surveys of engineering program graduates in the workforce quoted by Kmiec (2004) that "American engineering students are finding themselves under-prepared for the communication demands of the engineering workplace. Similar surveys of employers have suggested that industry demands graduates who are able to produce reports and workplace communications". In fact, *technical and professional communication* has been the deficiency most cited in a number of industrial and graduate surveys over the last twenty years, leading the Accreditation Board for Engineering and Technology (ABET) to list "an ability to communicate effectively" as one of eleven Engineering Criteria (EC) for certifying engineering departments nationally. The demands of former students, of

industry, and of the accreditation board have prompted the engineering education community to investigate the integration of communication proficiencies into the four-year engineering curriculum; two models currently dominate: A number of institutions offer engineering students communication instruction peripherally: the English or Communication department offers a *technical writing class* instructed by English and Communication faculty or graduate students who *often have no technical background or experience working with technical documents.* The curriculum and assignments for this class are typically based on business communication skills and generic technical report writing heuristics and fail to cover the nuances of communication within the students' engineering disciplines. Engineering students who attend these classes often marginalize the experience as a busywork requirement not relevant to their chosen course of study or their professional development. They often complain that the assignments and lectures have no basis in what they actually do and fail to find real application for the communication concepts covered in class. At the same time, instructors who teach these courses find students' lack of motivation and lack of ability to connect communication and technical concepts especially challenging. At other institutions, *engineering communication instruction is diffused across the engineering curriculum*: students receive prescriptive writing and speaking instructions in core and disciplinary elective classes before writing reports and giving presentations on technical topics, and communication is evaluated in combination with technical proficiencies. Engineering instructors, however, rarely have the tools or training to teach more than contextualized composition and presentation rules and preferences. Students often complain that time set aside for communication instruction in engineering courses tends to be a repeat (or variation) of the professor's opinion about what good communication skills are, and they begin viewing communication advice as a professor's personal hurdle rather than developing an independent ability to formulate or recognize good communication practices. At the same time, engineering instructors typically see communication material as time consuming and subordinate to the technical material they must cover.

With the support of a grant from the National Science Foundation, a multidisciplinary research and teaching team based in the chemical engineering department at North Carolina State University (NC State) has been developing a hybridized method of

integrating communication instruction into engineering degree programs that will motivate and challenge students to develop a perception of themselves as communicating professionals.

In this novel integration model, engineering communication instruction occurs in an accredited module and consultation series: students are provided instruction about theories and methods of teaming, writing, and speaking within the context of ongoing engineering experiments and design projects, and they are given a facilitated opportunity to practice what they have learned. The series is directly integrated into the assignments and requirements of an associated engineering course, students are able to immediately apply the technical communication and project management concepts taught—they use peer editing techniques to change their team editing workflow; they use collaborative presentation techniques to practice their presentations; and so on. Instructional time in the series, however, functions independently of the associated disciplinary course, giving students the
opportunity to work with a consultant, to experiment with communication, and to develop their own understanding of and methods of applying technical communication concepts. Seeing their initial reports and oral presentations develop into more effective pieces of communication (and seeing their scores increase),
students witness firsthand the value added by developing technical communication skills.

When it comes to all things technical, conventional wisdom tells us that engineers are second to none. But it's a different story when it comes to social skills. It is notably correct to say that engineers don't exactly have a reputation for being sociable, flexible, or even approachable. Whether it is fair or not to say this, it is a widespread assumptions about engineers are being actively deconstructed by higher education institutions in the United States of America particularly, seeking to equip the current generation of engineering students with not only technical know-how, but social and "soft" skills as well (Akbar Ali, 2006). One might wonder why and what's behind the sudden push by universities to produce *people-smart engineers*?
Tina Seelig (AP, 2007), an executive director of the Stanford Technology Ventures

Program stressed that it is no longer good enough for engineers to come out of school with purely technical-level training. They need to know the business environment in which they are going to work and in this fast-paced world, engineers are not isolated in their cubes anymore." This idea is echoed by University of California and Berkeley. But Stanford and Berkeley aren't the only universities tackling the issue head on, nor are they the first. In the 1990s, MIT instituted a similar practice when industry concerns about American productivity highlighted the fact that less was getting accomplished because professional engineers were being churned out of schools without the proper workplace communications skills. Such programs became increasingly popular when the accreditation body for engineering schools implemented a new rule requiring that all accredited schools provide formal instruction in communication and teamwork. Barbara Masi, director of education innovation at MIT's engineering school also expressed concern of this same issue (Leiserson et. al., 2004). Much of the voiced need for change in the demeanor of engineering professionals came from established engineering firms, consultants, and industry leaders. Subsequently, at MIT, a program called Undergraduate Practice Opportunities Program (UPOP) was introduced to provide professional engineering experience and develop students' non-technical professional abilities with a goal to integrate three essential parts of effective learning: knowledge, experience, and reflection.

Andrew Burroughs, who heads the Chicago branch of Palo Alto-based design company IDEO, one of the most eminent design consultancies in the world, based in Palo Alto, California, with offices in London, Munich, Shanghai, and four other U.S. cities affirms that, *"We're looking for engineers that have a foot in both camps. A foot in the camp of being a very smart technical contributor, and a foot in the camp of being an interesting, curious person who can communicate about a lot more than just engineering and technical matters"* (Locke, 2007). Of course, the necessary changes had to take place at the pre-professional level, which they did as universities redesigned their engineering curriculum to include much more collaborative and project work. What they found was that students not only learned to work well in groups, but also sharpened their technical savvy and produced better products. "You can have an engineered object that is designed

to make the world a better place, but if it can't be built and sold, it won't do any good," said James Holloway, associate dean for undergraduate education in Michigan's College of Engineering (Locke, 2007).

The collective push for a paradigm shift in the university goals and curriculum appears to have succeeded in America. University of California-Berkeley engineering dean Shankar Sastry affirms, "*The days of boot camp — where we say 'Thou shalt study physics and mathematics and, oh by the way, you'll find out what's going to come out of this next year or the year after' — I think are gone*" (Locke, 2007)

Dire need for change in Malaysia

In Malaysia, all programs and degrees offered by universities are scrutinized and approval must be obtained not only from the Ministry but also from the professional engineering bodies. Funding engineering schools or programs is not a big issue as in India because Malaysian government is giving and subsidizing huge amount of money. However, the quality of graduates is still being questioned. Issues that were brought forth by several parties are more concerned on additional skills that engineering students should acquire before and after graduating. This has been the same worry in the United States as mentioned earlier. In a dialogue held at the Equatorial Hotel, Putrajaya between the industries and Malaysian public universities in 2002 where I was present also, Tengku Mahaleel, the then Chairman of Proton, highlighted that most local graduates lack communication skills (Noor Raha et. al. 2002). I am not sure whether Tengku Mahaleel was merely echoing what had been stipulated by people in the United States or just from hearsay because he did not show any specific data. However, to meet and exceed the "said" expectation of all stakeholders, universities were recommended to review the language and communication courses and teaching approaches. The challenge now is to provide better ways for faculty to work with students, and to help them enhance their people-related skills. We should now be training engineers who can work with other people, who can communicate, be inventive, creative, and have ideas and the courage to see them through".

An effort by the Universiti Putra Malaysia or UPM is commendable. A model was proposed which outlined the following subjects as in Table 1, to be included in engineering programs (Megat Johari et al., 2002). Interestingly, the subjects are meant for the conventional engineering programs. Many new universities now are offering other variants of engineering which are more towards "Applied Engineering" such as Mechatronic, Bioprocess, Manufacturing, Minerals, Robotics etc. The model as stipulated by Megat Johari also offers too many choices on global & strategic skills and industrial skills. There is a possibility that subjects taught or learned through this model are "loosely-coupled" and taught not in the context of engineering interest. This is to reiterate what Kmiec (2004), Seelig (2007) and Ali Akbar (2006) had said earlier. As such there is no focus in the effort to solve current deficiencies in skills as required by the industries. For UPM, it would be convenient to offer those mentioned subjects because the university has all the support facilities from its School of Social Sciences, ICT, Business and Management. However, there are tendencies engineering students will have to learn something which are not tailored specifically to their engineering needs. For Universiti Malaysia Perlis, Universiti Malaysia Pahang, Universiti Teknologi Tun Hussein Onn Malaysia and Universiti Teknikal Malaysia (UTeM), they are relatively handicapped because they do not have those support humanities and social science institutions. Engineering lecturers who themselves are underprepared in those skills and knowledge will not be able to provide optimum guidance and teaching in those subjects. It is therefore, I am suggesting different models be used in 2008 by different universities to suit their own niche areas without compromising the requirements as stipulated by the Ministry and the Board of Engineers of Malaysia.

Table 1: A New Engineering Education Model proposed by Megat Johari et.al. (2002)

Skills	**Subjects**	**Credits**
Global & Strategic	1. Language 2. Strategic Planning 3. Information Technology 4. Multimedia 5. International	15 Credits

	Business		
	6.	Environment	
Industrial	1.	Management	15
	2.	Finance	Credits
	3.	Economics	
	4.	Engineers in Society	
	5.	Communication	
	6.	Law	
	7.	Occupational Safety	
	8.	Human Resource	
	9.	Management	
	10.	Innovation	
Humanistic	1.	Islamic Civilisation	10 Credits
	2.	Asian Civilisation	
	3.	Nationhood	
	4.	Sociology	
	5.	Psychology	
Practical	1.	Final Year Project	15 Credits
	2.	Industrial Project	
	3.	Design	
Professional	1.	Professional Subjects	30±50 Credits
	2.	Civil Engineering e.g.	
	3.	Foundation Engineering	
	4.	Water & Waste Engineering	
	5.	Highway Engineering	
	6.	Concrete Structures	
	7.	Public Health Engineering	
	8.	Surveying	
Scientific	1.	Engineering Sciences e.g.	50±30 Credits
	2.	Engineering	

3.	Mathematics Engineering Materials
4.	Fluid Mechanics
5.	Engineering Statistics
6.	Thermodynamics
7.	Engineering Mechanics
8.	Programming

Conclusively, it is obvious that humanities and social science have significant roles in developing good and better engineers. Malaysia should be wary of this otherwise we will lose out in the near future if we were to hold rigidly to the conventional paradigm of engineering mindset. The Board of Engineers of Malaysia and the Ministry of Higher of Education has to be more proactive, open-minded and forward looking to the current trends and progress of time. Time has changed and engineers must not think like lords who only give orders and instructions or sit in their cool air-conditioned rooms. Engineers are not supposed to be arm-chair managers or computer-savvy designers cooped in their laboratories interfacing with society through the Internet with little social or human interactions.

In the era of global market, Malaysia must not wait or depend on foreign investment. It is time that we have to go out and venture into foreign business and markets. This thinking of producing engineers of world standard must not be just a rhetoric, but translated into focused action and implemented immediately. It is dreadful to think that even though many Malaysian engineers were trained in the US and Europe, but few ever work as expatriates, consultants, scientists, entrepreneurs in foreign lands. Another irony is that our curriculum and the way we train our engineers is to get them work in our local factories and industries. We are also obsessed in fulfilling the requirements of industries and feel very proud in our evaluation on marketability. As such, students migrate to the urban areas and work as employees. Rural areas are left neglected with little economic progress and transfer of technology, except for those introduced by the government. This

is due mainly to our curriculum which put little interest in entrepreneurship. In comparison, the Silicon Valley, for instance, is among the world's most ethnically diverse. Not only do Asian and Hispanic workers dominate the low-paying, blue-collar workforce, but foreign-born scientists and engineers are increasingly visible as entrepreneurs and senior management. More than a quarter of Silicon Valley's highly skilled workers are immigrants, including tens of thousands from lands as diverse as China, Taiwan, India, the United Kingdom, Iran, Vietnam, the Philippines, Canada, and Israel (Saxenian, 2002). Where are the Malaysians? This is actually not brain-drain, but brain circulation as Saxenian (2002) termed it. Highly educated and skilled immigration increasingly benefits both sides. Economically speaking, it is blessed to give and to receive. These new foreign-born entrepreneurs are highly educated professionals in dynamic and technologically sophisticated industries. They have been extremely successful. By the end of the 1990s, Chinese and Indian engineers were running 29 percent of Silicon Valley's technology businesses. By 2000, these companies collectively accounted for more than $19.5 billion in sales and 72,839 jobs. And the pace of immigrant entrepreneurship has accelerated dramatically in the past decade. Interestingly also, many would send their savings and income to home-countries whereby it becomes an alternative source of revenue to the countries concerned.

Conclusion

A big paradigm shift is deemed necessary for Malaysian universities. One single model cannot be used for all universities and we should be looking at many variables and relook at our goals and objectives. The Board of Engineers and other engineering bodies should play the role as advisors, rather than as an authority to dictate terms rigidly without much flexibility and understanding of the current global needs.

In producing entrepreneurs, we should be looking not only at the local but also foreign markets and opportunities. University authorities must think ahead with clear visions of the future. Transnational entrepreneurship should also be one of main goals and we should adopt what the Taiwanese, Indians and the Chinese are doing, rather wait and see.

We should be building a two-way bridge connecting our engineers that we produce with the US, European, Middle-Eastern, Chinese, Japanese, Koreans, Taiwanese communities in order to be competitive. For this purpose, international exchange programs, work attachments, industrial training in foreign countries, study visits and shared projects would provide good experience for our students and academicians.

Since humanities and social sciences have important roles in the current holistic needs of engineering, experts from these areas must also sit in the accreditation bodies and in the engineering segments of the Ministry of Higher Education. In addition, engineering professors should also have positive attitude and acquire in-depth knowledge and skills in areas humanities and social sciences, such as engineering communication skills, entrepreneurship, effective leadership, management, finance, accounting, human resource management, business and international networking. The experience and engineering models developed by MIT, University of California and Stanford must be emulated and taken into serious considerations by Malaysian authorities and universities.

Reference:

Akbar Ali. *Employment Crossing-Engineering Crossing: Engineering People Skills.* http://www.engineeringcrossing.com/article/index.php?id=300137

American Heritage Dictionary. (http://education.yahoo.com/reference/dictionary/entry/engineer

Associated Press, International Herald Tribune: Technology and Media (2007). New engineering whiz kids learn people skills, too,. Dec 10 2007

Charles Leiserson, Barbara Masi, Chris Resto, Dick K.P.Yue (2004). *Development of engineering professional abilities in a co-curricular program for engineering sophomores*. ASEE Conference 2004. http://www.calvin.edu/academic/engineering/aseeled/program/abstracts2004/2004-1998_Abstract.pdf

David M. Kmiec, Jr. (2004). *Theory, Research, Education, and Training: Teaching Engineering Communication: A Novel Vertically-Integrated and Discipline-Conscious Curriculum* http://www.stc.org/ConfProceed/2004/PDFs/0039.pdf

Davidson, Adam. (2008). Asia producing engineers short of skills. NPR. http://www.npr.org/templates/story/story.php?storyId=9910495

Definition of Engineer. Wikipedia http://en.wikipedia.org/wiki/Engineer

Forbes AOL Money and Finance Report. (2008). (http://www.forbes.com/lists/2008/10/billionaires08_Warren-Buffett_C0R3.html)

Locke, Michelle. (2007). *Engineers learning people skills, too* **.** USA Today,12 Sept 2007

All India Council for Technical Education or AICTE. http://www.wes.org/ewenr/07jan/feature.htm

M. M. N. Megat Johari, A. A. Abang Abdullah, M. R. Osman, M. S. Sapuan,N. Mariun, M. S. Jaafar, A. H. Ghazali, H. Omar And M. Y. Rosnah. (2202). *A New Engineering Education Model for Malaysia*. Faculty of Engineering, University Putra Malaysia, 43400 UPM Serdang, Malaysia. http://www.ijee.dit.ie/articles/Vol18-1/IJEE1252.pdf

Noor Raha Mohd Radzuan, Fatimah Ali, Hafizoah Kassim, Haslinda Hashim, Najah Osman and Ramle Abid. *Developing Speaking Skills Module for Engineering Students*. International Journal of Learning, Volume 14, Issue 11, pp.61-70. http://ijl.cgpublisher.com/product/pub.30/prod.1565

Saxenian, AnnaLee. (2202). *Brain Circulation: How High-Skill Immigration Makes Everyone Better Off*. Immigration. The Brookings Institution, Winter 2002. http://www.brookings.edu/articles/2002/winter_immigration_saxenian.aspx

Appendix 1

2008 Top 10 World Richest People

Forbes http://www.forbes.com/lists/2008/10/billionaires08_Warren-Buffett_C0R3.html

	Name	Asset	Citizenship	Industry	Education and personal details
1.	Warren Buffett, 77, self-made man	$62.0 bil	United States	Investments	University of Nebraska Lincoln, Bachelor of Arts / Science Columbia University, Master of Science America's most beloved investor is now the world's richest man. Soared past friend and bridge partner Bill Gates as shares of Berkshire Hathaway climbed 25% since the middle of last July. Son of Nebraska politician delivered newspapers as a boy. Filed first tax return at age 13, claiming $35 deduction for bicycle. Studied under value investing guru Benjamin Graham at Columbia. Took over textile firm Berkshire Hathaway 1965. Today holding company invested in insurance (Geico, General Re), jewelry (Borsheim's), utilities (MidAmerican Energy), food (Dairy Queen, See's Candies).

						Also has noncontrolling stakes in Anheuser-Busch, Coca-Cola, Wells Fargo. Insurance operations flourished in 2007. "That party is over. It's a certainty that insurance-industry profit margins, including ours, will fall significantly in 2008." The Oracle of Omaha issued a challenge to members of The Forbes 400 in October; said he would donate $1 million to charity if the collective group of richest Americans would admit they pay less taxes, as a percentage of income, than their secretaries. Had long promised to give away his fortune posthumously. Irrevocably earmarked the majority of his Berkshire shares to charity in 2006, mostly to the Bill & Melinda Gates Foundation. Gift was valued at $31 billion on day of announcement; donation will far exceed that sum so long as Berkshire shares continue to rise.
2.	Carlos	$60.0 bil	Mexico	Communications	NA.	

	Slim Helu, 68, Self-made man					Second-richest man in the world this year; even richer than Microsoft's Bill Gates, at least for now, thanks to strong Mexican equities market and the performance of his wireless telephone company, America Movil. The son of a Lebanese immigrant, Slim made his first fortune in 1990 when he bought fixed line operator Telefonos de Mexico (Telmex) in a privatization. In December, America Movil struck a deal with Yahoo to provide mobile Web services to 16 countries in Latin America and the Caribbean. A widower and father of six, Slim is a baseball fan and art collector. He keeps his art collection in Mexico City's Museo Soumaya, which he named after his late wife. In recent years, he has donated close to $7 billion worth of cash and stock to fund education and health projects, and to the revitalization of Mexico City's downtown historical district.
3.	Gates III, self-made man	William	$58.0 bil	United States	Software	Harvard University, Drop Out Harvard dropout and Microsoft

visionary no longer the world's richest man. Blame Yahoo: Microsoft shares have fallen 15% since the company boldly attempted to merge with the search engine giant to better fight Google for Internet dominance. Gates is preparing to give up day-to-day involvement in the company he cofounded 33 years ago to spend more time focused on his philanthropic endeavors. Bill & Melinda Gates Foundation has $38.7 billion in assets, donates to causes aimed at bringing financial tools to the poor, speeding up the development of vaccines (for AIDS, malaria, tuberculosis), bettering America's lagging high schools. Sells 20 million Microsoft shares every quarter, proceeds going to private investment vehicle Cascade; more than half of net worth now outside of Microsoft. Company spent $6 billion to land Web ad firm Aquantive last May. Would-be rival to Apple's iPod, the Zune, not yet a hit. Believes

						Microsoft's far-flung bets, including 10-year affair with Internet-based television, may soon pay off; says next 10 years will be the "most interesting" in software history.
4.	Mittal, 57, Inherited and growing.	Lakshmi	$45.0 bil	India – London, Europe, Russia	Manufacturing	St Xavier's College Calcutta, Bachelor of Arts / Science Heads world's largest steelmaker, $105 billion (sales) ArcelorMittal, which accounts for 10% of all crude steel production. Just delivered 580 tons to be used in construction of the World Trade Center memorial in New York. With 44% stake, is the company's largest shareholder. Longtime resident of London is Europe's richest resident.
5.	Ambani, 50, Inherited and growing.	Mukesh	$43.0 bil	India – Mumbai, Asia & Australia	Manufacturing	University of Bombay, Bachelor of Chemical Engineering Stanford University, Master of Business Administration Asia's richest resident heads petrochemicals giant Reliance Industries, India's most valuable company by market cap. His fortune is up $22.9 billion since last year, making him the world's second biggest gainer in

6.	Ambani, 48, Inherited and growing	Anil	$42.0 bil	India – Asia & Australia	Diversified	terms of dollars. The biggest gainer was his estranged brother Anil, who ranks 6th in the world just behind his older brother. The sons inherited their fortune from their late father, renowned industrialist Dhirubhai Ambani. But they couldn't get along and in 2005 their mother brokered a peace settlement breaking up the family's assets. Mukesh is using some of his money to build a 27-story home. University of Bombay, Bachelor of Arts / Science University of Pennsylvania Wharton School, Master of Business Administration The year's biggest gainer, Anil Ambani, is up $23.8 billion in the past year, and is closing gap with estranged brother, Mukesh, who ranks one spot ahead of him in the world at number five. The sons inherited their fortune from their late father, renowned industrialist Dhirubhai Ambani. But they couldn't get along and in 2005 their mother brokered a peace settlement breaking up the family's assets. A marathon

					runner, his biggest asset is his 65% stake in telecom venture Reliance Communications. He recently raised $3 billion from the highly anticipated initial offering of his Reliance Power, the biggest in India's history. Despite the hype, the stock tumbled 17% immediately after its February listing. In a bid to appease investors, company's board recently approved the issue of bonus shares. Still feuding with brother Mukesh: battling him in court over a gas-supply agreement.
7.	Kamprad, 81, self-made	Ingvar	$31.0 bil	Sweden	Retailing	NA. Peddled matches, fish, pens, Christmas cards and other items by bicycle as a teenager. Started selling furniture in 1947. Now his company Ikea, which sells hip designs for the cost conscious, is one of the most beloved retailers in the world, with an almost cult-like following. Ikea now has stores in 40 countries, from Sunrise, Florida, to Guangzhou in China. As egalitarian as his brand, Kamprad avoids wearing suits, flies economy class and

						frequents cheap restaurants. Has been quoted as saying that his luxuries are the occasional nice cravat and Swedish fish roe. Says his home is furnished mostly with his own Ikea products. Last May was awarded the Global Economy Prize by the University of Kiel for his contributions to society.
8.	Singh, 76, Inherited and growing	K.P.	$30.0 bil	India – Delhi, Asia and Australia	Real estate	NA. Singh is now the world's richest real estate baron after listing his real estate development company DLF in 2007. The offering helped triple his fortune to $30 billion this year, up from $10 billion. A former army officer, known as K.P., he joined his father-in-law's Delhi Land & Finance in 1961. Singh later built DLF City in Gurgaon, his showpiece township on the outskirts of Delhi, by acquiring land from farmers. Over time, he transformed it into one of India's biggest real estate developers. Group plans to raise another $1.5 billion by listing a subsidiary in Singapore. A keen golfer, he now leaves son Rajiv,

						daughter Pia to run operations.
9.	Deripaska, 40, Self-made man	Oleg	$28.0 bil	Russia	Diversified	Moscow State University Plekhanov Academy of Economics Former metals trader survived the gangster wars in the post-Soviet aluminum industry. His holding company, Basic Element, now owns Russian Aluminum (UC Rusal), automobile manufacturer GAZ, aircraft manufacturer Aviacor and insurance company Ingosstrakh. In 2006 Rusal, SUAL and Glencore International, of Switzerland, merged their aluminum assets into the United Company Rusal, the world's largest aluminum producer. Married to a relative of Yeltsin, Deripaska has been busy expanding UC Rusal's activities in Russia and abroad, moving it into aluminum production in Nigeria and China. To integrate vertically, has signed agreements to produce coal in Kazakhstan and invest in a nuclear power plant

						in eastern Russia. Attempting to get a stake in Norilsk Nickel, which co-owner (and fellow billionaire) Vladimir Potanin is fighting.
10.	Albrecht, 88. self-made man	Karl	$27.0 bil	Germany – Germany, Europe and Russia	Retailing	NA . Germany's richest man. After World War II Karl and his younger brother, Theo, developed their mother's corner grocery store into discount supermarket giant Aldi, which now has more than 8,000 stores and $67 billion in sales. They eventually split ownership and management of the chain into North and South regions. Now retired, Karl used to manage more profitable southern half of Aldi's business in Germany. Fiercely private: Little known about him other than that he apparently raises orchids and plays golf.

Brief Biodata

Name: Dato' Prof. Dr. Jamaludin Mohaiadin

Organisation: Universiti Malaysia Perlis (UniMAP)

Designation: Visiting Professor (Grade Khas Professor VK7)

Current Position: Director, Sustainable Development Unit,
Chancellery, Universiti Malaysia Perlis.

Positions held:

1. Deputy Vice-Chancellor (Universiti Sains Malaysia) from 2000 – 2007. Retired on 3 March 2007.
2. Director, Center for Instructional and Multimedia, Universiti Sains Malaysia
3. Deputy Director, Center for Instructional and Multimedia, Universiti Sains Malaysia
4. Instructional Designer cum Curriculum Specialist, Center for Instructional Development and Distance Education, University of Pittsburgh, Pittsburgh, Pennsylvania, USA (3 years)
5. Deputy Head, Computer for Management Dept., National Institute for Educational Management, Ministry of Education.
6. High School teacher

Qualification:

1. Diploma in Education – Language Institute, Kuala Lumpur.
2. BA (Hons) in Humanities - Universiti Sains Malaysia, Penang
3. Master of Education (MEd) in Project Planning and Evaluation – University of Pittsburgh, Pittsburgh, Pennsylvania, USA.
4. Doctor of Education (EdD) – Instructional Design and Technology, University of Pittsburgh, Pittsburgh, Pennsylvania, USA.

Experience and Involvement:

1. Very wide experience in university management, personnel management, curriculum development, student development, performance evaluation, Internet, multimedia and audio-visual design and development, computer-based education, event management and training technology.
2. Chairman for Deputy Vice-Chancellors' Council (2005-2007)
3. Special Advisor to Indonesia-Thailand-Malaysia Growth Triangle Varsity Carnival
4. Involvement:
    a. FISU (Member of World University Games Council) 2005-2007.
    b. Head Consultant, Development of ICT Labs and Language Labs, Universiti Teknologi PETRONAS - 1999
    c. Head Consultant, Development of MICET (Malaysia Institute for Chemical Engineering and Technology, Universiti Kuala Lumpur) – Training of Academic Personnel - 2001
    d. Program Manager, Training Technology for Human Resource Managers, FMM, Penang – 1996-1998
    e. Numerous other involvement with multinational companies and bodies in developing instructional materials and training
    f. Member of AECT, APSSA (Council Member), APEID-UNESCO, FISU, AUSF (Council Member).