

Empowering Engineering Students Through Employability Skills

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Abstract: A professional course program like engineering strives to get the maximum number of its students placed through campus interviews. While communication skills have been added in all the engineering courses with the aim to improve their performance in placement, the syllabus mostly concentrates on the development of four language skills. The students are not made aware of the employability skills and their significance. This essay intends to enlist the importance of skills and why students need to be aware of the skills they possess and how they can work on packaging their candidature around a few skills. The discussion starts by addressing the apparent gap between academic programs for engineering students and industry skills requirements. A list of vital employability skills from the standpoint of engineering students follows, with a discussion on how to potentially develop such skills through campus life. The essay stresses the role of academia in filling this gap by acting as facilitators in a three-step process (i.e., awareness, self-analysis, and acquisition). The author concludes that the combination of both employability skills along with an engineering degree should ensure students meet the high expectations of the employers.

Keywords: soft skills, hard skills, domain-general skills, domain-specific skills, skill development, employability, workplace competencies, engineering students

Introduction

Every year in India, around 1.4 million students appear in the all-India entrance examination for the 19 Indian Institutes of Technology, 31 National Institutes of Technology, 18 Indian Institutes of Information Technology, and other engineering colleges (“CBSE JEE main 2016”, 2016). After a 4-year degree program, the students are expected to be ready to enter the industry. Yet, expectations from the multinational companies and growing competition has led to students’ anxiety and failure in acquiring a job. In the rat race, individuality is often lost and students with technical training and average competencies dominate the list of degree holders. These engineers are assessed in interviews as the employers want to select people who are potential leaders and innovators, those who can change the shape of the world with their ideas and business acumen.

The general perception of an engineer’s role is limited to acquiring technical skills along with sound knowledge of science and mathematics. However, Nguyen (1998), in her paper “The essential skills and attributes of an engineer: a comparative study of academics, industry personnel, and engineering students,” disagrees and comments on the role of engineers by stating that

The dynamic world in which engineers operate presents them with new demands and provides new challenges in the diverse, profound and incessant changes which confront mankind as it heads towards the 21st Century. . . . Engineers are involved in the implementation, application, operation, design, development and management of projects and processes, although the type of work that engineers do will vary depending on the chosen field of study. (pp. 65-66)

Hence, the workplaces have changed and most engineers work in a multidisciplinary environment. Careers that begin at a specialized technical level broaden with the rise in hierarchy. As engineers move up the hierarchy, their duty undergoes a paradigm shift from technical to management oriented. They must acquire an understanding of all aspects of the industry in order to manage efficiently. In a multidiscipline environment, along with their specialization, they must learn and administer various technical and nontechnical jobs. Intrinsically, the role of the engineer and the expectations from the industry have broadened and, in order to meet the demands of engineering training and education, need to be revised. There is a dire need to instil in the aspiring engineers a broad range of skills along with the regular technical skills.

Understanding the Academia–Industry Gap

Industry expectations most often do not match with the curriculum, where 70% theory and 30% practical is the norm (e.g., Radermacher & Walia, 2014; Tulsi & Poonia, 2015). Many newspapers in India have repeatedly highlighted the limitations of engineering graduates. On July 15, 2014, the *Times of India* published an article with the heading, “Only 18% engineering grads are employable, says survey.” Based on the survey, the article argued the incompetence of the engineering graduates by stating:

Less than one out of four engineering graduates are employable, a survey has found. The third edition of the National Employability Report, Engineering Graduates - 2014, released by a private employability solutions company, revealed that though 18.33% of the engineers are employable, 18.09% actually get a job. Of the 1.2 lakh candidates surveyed across multiple states, 91.82% lack programming and algorithm skills, 71.23% lack soft and cognitive skills, 60% lack domain skills, 73.63% lack English speaking and comprehension skills and 57.96% have poor analytical and quantitative skills. (“Only 18% engineering grads,” 2014, para 1-2)

Several studies stress the same thought that the engineering graduates, even from the premier institutions, are unable to meet industry expectations (e.g., Lakshminarayanan, Kumar, & Ramanakumar, 2014; Llorens, Llinàs-Audet, Ras, & Chiaramonte, 2013; Radermacher & Walia, 2014). The industry expects students to be competent in the latest trends, but academia is often slow and emphasizes the basics of the subjects, which are often outdated. In an article published in *Business Today* (Singh, 2016), Varun Agarwal, chief technology officer and cofounder of the employability evaluation company Aspiring Minds, clearly remarked, “Colleges need to plug the gap in the first or second year. Foundational skills like English, logical ability, should be taught to students in first or second semester by doing bridge courses” (para 9). Unfortunately, very little attention is paid to the understanding and development of these skills (often called employability skills), which are often overshadowed by the degree or qualification. Until the last couple of years, employability skills have remained an obscure reason for a person’s success. But, it has been gradually acknowledged that neither qualification nor merit guarantees success in any career; yet, skills that can be the panacea for a successful career are often ignored.

This gap between the academic curriculum and industry needs may be bridged by modifying the curriculum and preparing students to match the expectations. While developing technical and hard skills, there is also a need to give importance to soft skills. Engineers and people associated with engineering education in India must concentrate on these essential soft skills as engineers will be working in a team, reporting to someone else, writing reports, dealing with work pressures, giving presentations, and so forth. As skills demand more attention in the curriculum and therefore in the students' goal setting, let us etymologically analyse skills in a comprehensive manner.

Decoding Skills and Their Significance

Skills can be defined as the expertise or talent to do a job or task or the ability to do something well. Businessdictionary.com (n.d.) defines skills as “an ability or capacity acquired through deliberate, systematic and sustained effort to smoothly and adaptively carry out complex activities or job function involving ideas (cognitive skills), things (technical skills) and or people (interpersonal skills).” According to the *Cambridge Dictionary* (n.d.), a skill is “an ability to do an activity or job well, especially because you have practised it.”

As can be understood, the literal meaning or the meaning in a business context clearly indicates that skills are an ability that is acquired and not inherent. Hence, a person can acquire skills that interest him or her, and college education can easily be the training ground to inculcate some skills in the students. For better understanding, skills are sometimes divided into domain-general skills and domain-specific skills (Tricot & Sweller, 2014). Domain-general skills are those that are helpful in all the jobs (Greiff et al., 2014). They are commonly called soft skills, whereas domain-specific skills are those that are required for specific jobs and are also called hard skills (Laker & Powell, 2011).

Recent studies show that employers look forward to fresh engineers who have sound knowledge of hard skills and are also adept in a few soft, or domain-general, skills (Markes, 2011). Employee expectations do not end with technical skills as in a multidiscipline environment; the role and responsibility of the engineer will keep changing and evolving. Considering the growing expectations and requirements, students can be made aware of the importance of domain skills before they face campus interviews. A specific set of skills, if acquired, will help the students fulfil the expectations. As Hansen and Hansen (n.d.) opined in their article, “What do employers really want? Top skills and values employers seek from job-seekers,” beyond these job-specific technical skills

certain skills are nearly universally sought by hiring managers. . . . The good news is that most jobseekers possess these skills to some extent. The better news is that jobseekers with weaknesses in these areas can improve their skills through training, professional development, or obtaining coaching/mentoring from someone who understands these skills. (para. 2-3)

Skills developed by enhancing attributes could make a person the best choice for a certain post. If a student hones some attributes and acquires some skills along with his degree, he will have what the employers want. To understand the skills required in engineers, let us enlist some skills and understand what they mean.

Skills and Their Implications

Communication skills. The ability to speak and write clearly and concisely is a skill that is most sought after (Shokri et al., 2014). Employers often feel that a candidate who is able to listen carefully and can convey his thoughts and ideas will add to the effectiveness of the workforce (Carnevale & Smith, 2013; Ortiz, Region-Sebest, & MacDermott, 2016). *The Hindustan Times* published an article entitled, "97% Engineering graduates cannot speak English fluently: Survey" (Puranik, 2015), which stated that most of the students lacked English language proficiency. Furthermore, according to Nguyen (1998), "The desirable skills and attributes for engineers include the ability to communicate effectively, both verbally and in writing, to peers, the employers, client and the community; engineers should be bilingual" (p. 73).

Teamwork. Salas, Sims, and Klein (2004) defined teamwork as "a set of interrelated thoughts, actions[,] and feelings of each team member that are needed to function as a team and that combine to facilitate coordinated, adaptive performance[,] and task objectives resulting in value-added outcomes" (p. 562).

Employers look forward to hiring candidates who can work collaboratively for a common goal. Cooperation and mutual respect in a diverse group are seen as a winning combination. Candidates who are comfortable and happy to cooperate in a team appeal the most to the employers.

Problem-solving skills. The ability to view problems and challenges pragmatically and to have an analytical approach to solve problems and issues is an ability not all candidates possess. It has been documented "employers rarely explicitly list problem-solving as a key skill, but they do frequently mention critical thinking, initiative, adaptability, and leadership" (p. 111). If the candidate can weigh the situation or analyze it from different angles, he or she can demonstrate problem-solving skills. This, in a way, conveys his or her potential to be a decision maker.

Initiative and enterprising. The confidence to take initiative is the characteristic of a true leader. According to the University of Leicester (n.d.):

Being "enterprising" is not the same as having an ambition to be self-employed. Rather it is someone who is characterized by a particular mix of individuality, creativity and leadership. These are key skills and increasingly demanded by academic and non-academic employers and research organizations. (para 1)

Planning and organizing. The habit to work in a haphazard way that leads to confusion and loss of time and effort can be a weakness in a candidate. Successful people and thriving organizations boost of meticulous planning and execution as the key to their success. However, when an individual displays these skills, he or she displays clarity of thought and precision that will alleviate the organization he works for. In this regard, Hansen and Hansen (n.d.), in their article "What do employers really want? Top skills and values employers seek from jobseekers," describe planning/organizing as a skill that "deals with your ability to design, plan, organize, and implement projects and tasks within an allotted timeframe. [It] also involves goal-setting" (para. 18).

Managerial skills/leadership skills. The ability to motivate people, to assign and delegate work according to the capability of the individual, shows leadership skills. For Kotter

(2013), there is a distinction between management and leadership. Kotter sees management as “a set of well-known processes, like planning, budgeting, structuring jobs, staffing jobs, measuring performance and problem-solving, which help an organization to predictably do what it knows how to do well” (2013, para. 8). However, “leadership is about vision, about people buying in, about empowerment and, most of all, about producing useful change. Leadership is not about attributes, it’s about behavior” (2013, para. 9). In either case, employers look forward to selecting students who can work in a team but can also motivate and lead by setting a good example. In the present scenario, engineers need to show expertise beyond their regular technical field. Leadership skills can facilitate them to acquire the desired image suitable for the industry.

Interpersonal skills. The large amount of time spent in any workplace demands that the people relate to their co-workers and learn to cooperate and motivate each other. In fact, “employers increasingly place value on workers who get along with people at all levels, from the mailroom staff to the president” (Sommers, 2008, p. 6). The ability to share a comfortable understanding with colleagues irrespective of their diverse opinion, expertise, and background builds strong workforce based on interpersonal relationships. Hence, the ability to have cordial relationship with people in one’s personal and professional life displays interpersonal skills that can be a great advantage.

Adaptability or flexibility. This refers to one’s openness to new ideas and situations. Certainly, “one of the greatest challenges presented to all employees today is dealing with uncertainty” (Veres & Sims, 1999, p. 228). With the pace at which technology grows, engineers must adapt to new concepts and, with workplaces expanding across the globe, engineers have to learn to adapt to and accommodate any new situations, ideas, technologies, and so forth.

Creativity or innovation. Engineering is synonymous with innovation and, often, the passion to create something new attracts students to engineering. The urge to innovate and translate ideas into reality is the key to the success of any industry, especially engineering. For Berger, Surovek, Jensen, and Cropley (2014), “creativity is a core component for engineering, essential to innovation.”

Negotiation skills. For Fowler (1998), “influence is a broad concept, involving the effect on each person of the whole context in which the discussion takes place” (p. 3). Furthermore, “persuasion involves all those skills of argument and discussion that can be used by one person to obtain another’s agreement” (1998, p. 3). As such, persuasion and the ability to convince others are attributes of a confident and focused individual. They often come with being well informed and having good communication skills. Therefore, negotiation skills can easily prove the candidate’s capability to convince others and help make a unanimous decision.

Commercial awareness. This reflects business acumen and awareness of the competition in the market. In other words, “commercial awareness requires some knowledge of the business or financial context in which firms, transactions, or situations exist and operate” (Finch & Fafinski, 2014, p. 127). It equips the person with information related to the minor details of the competitors and their products and services. It helps them prepare and perform better in any competition.

Lifelong learning. A student with a degree in any branch of engineering must learn the tricks of the trade by joining the trade. Hence, students who show an aptitude to learn are always preferred to students who demonstrate a know-it-all attitude. For Naimpally, Ramachandran, and Smith (2012), students should not just “emerge from the academic setting

with the competency to recognize a need for lifelong learning, but he or she should have the ability to actively pursue the acquisition of knowledge” (p. 9). A self-motivated and eager-to-learn graduate will easily adapt to the industry he or she joins. Therefore, employers want lifelong learners rather than learned people.

Skills Development in College

By participating in extracurricular activities and organizing events, on and off the campus, the students can explore a number of qualities in their personality like leadership skills, planning and enterprising skills, and interpersonal skills.

Expectations for engineering students also include stress and time management skills along with integrity, perseverance, and confidence. These are attributes that go hand in hand with the above-listed skills and do not need a special explanation. Apart from all the soft skills that are mentioned in this article, the very obvious technical skills and computing skills are mandatory for all engineers. These skills can be acquired by developing certain attributes and making some behavioral changes. For instance, communication skills in English can be developed by regular practice of the language and by developing the four skills of listening, speaking, reading, and writing. Along with practicing those skills, if one consciously works to build his or her vocabulary, he or she can easily make communication skills a strength. Besides, using the language more and more can bring fluency and confidence in the speaker.

College is perceived to be the best place to develop team spirit and “it is said that possession of team spirit is one of the major skills” (Rao, 2010, p. 89). For Abell and Napoleon (2008), feeling valued and part of a group is a basic need, so “when you create team spirit and identity, staff members will see themselves as a group of people all working for a common goal, rather than a bunch of individuals competing with each other” (p. 62). Furthermore, by creating team spirit, students can demonstrate they “are open to communication from everyone” (2008, p. 62). One learns to work as a team in the classroom and by playing various sports like cricket, volleyball, basketball, and football. Secondly, life on campus has immense opportunity for participating in various formal and informal events and, while participating in myriad academic or other events, the students are exposed to the basic functioning of the team. All extracurricular activities in some way or another inculcate team spirit.

An easy way for aspiring engineers to acquire analytical skills could be by using their reasoning on numbers and calculations daily. It is often said that engineering students require sound knowledge of mathematics and science, but it is often seen that after joining an engineering college, the students become callous and ignore their regular studies. Most of the engineering colleges have also reported that students study one day before the examination. This might be in part due to the emphasis on test scores rather than learning (Holtgreive, 2016). In any case, analytical skills cannot be developed even if the student has the aptitude for them, as these skills require regular practice of mathematical problems or puzzles, anything that challenges the mind and tests their intelligence.

A common, frequently asked question in the interview—“How comfortable are you with change?”—tests the adaptability skills or flexibility of the candidate. This can be acquired easily by voluntarily learning something new. This way, by forcing themselves out of the comfort zone, students can train themselves to deal with change and can prepare for any unexpected change.

Negotiation skills are somewhat difficult to acquire, as there isn't any clear attribute to develop them. With the right mix of interpersonal skills, convincing power, knowledge, and the right attitude, however, the art of persuasion can be learned.

Active listening and general awareness of business and industries at large can facilitate commercial skills in the students. These skills, if acquired, can transform the chances of the candidate, as some common questions like "Why do you want to join our organization?" or "What do you know about our company?" can be easily answered. This skill will provide the student with the knowledge to comprehend, compare, and answer such questions in an effective manner. Commercial awareness skills can easily be developed as they can be self-accessed by reading the market value, work culture, services, products, and production of companies of interest.

The Role Academia Can Play in Developing These Skills

Whether we call them soft skills or employability skills, academia and the students must realize their importance and work to acquire them. By acting as facilitators in a three-step process (i.e., awareness, self-analysis, and acquisition), academia can contribute significantly in filling this gap. Students should be initiated into the awareness of these skills and their significance; secondly, encouraging self-analysis in the students to identify their strengths and specific attributes will facilitate goal setting. Lastly, once the clarity of strengths and attributes has been achieved, students should acquire these skills by maximizing participation in activities and courses that endorse those skills. This entire exercise will change the present scenario, in which we are training a mass of students without any specific attributes to make a mark in the industry. Gerson and Gerson, in their book *Technical Communication*, opined:

These skills are important because they help show how the candidate is different from all the other applicants. In addition, they show that although the candidate has not been trained in the job for which he is applying, he can still be a valuable employee. (p. 260)

Thus, even though these students should be trained by the particular industry that hires them, these skills would show some readiness for the job.

Lastly, if the students identify their attributes and sincerely work to acquire skills related to them, they will have the answer to the predictable questions in interview: "What are your strengths?" or "Why should we hire you?"

Conclusion

These skills are prerequisites for any engineering student since 4 years of studies and degree acquisition from any reputable institute will not ensure a job. However, the combination of these skills along with an engineering degree will ensure that students meet the high expectations of the employers. In an era of rapid change and fierce competition, their efforts to learn new things and acquire certain skills will not only make them confident and self-assured, but will also give them an advantage in the job interview. Employers clearly look forward to candidates who are focused and are passionate about the profession they aspire to enter; therefore, making an effort to hone their attributes can definitely improve their job prospects. Thus, the onus now is on academia to understand the needs of the industry and students by creating awareness and guiding the students in self-analysis and in acquisition of skills.

References

- Abdulwahed, M., Balid, W., Hasna, M. O., & Pokharel, S. (2013, August). Skills of engineers in knowledge based economies: A comprehensive literature review, and model development. In *2013 IEEE International Conference on Teaching, Assessment and Learning for Engineering (TALE)* (pp. 759-765). Bali, Indonesia: IEEE. <https://doi.org/10.1109/TALE.2013.6654540>
- Abell, S., & Napoleon, J. (2008). *Moving up to management: leadership and management skills for new supervisors*. Medford, OR: Inside Jobs Coaching Co.
- Berger, K., Surovek, A., Jensen, D., & Cropley, D. (2014, October). Individual creativity and team engineering design: A taxonomy for team composition. In *2014 IEEE Frontiers in Education Conference (FIE) Proceedings* (pp. 1-4). Madrid, Spain: IEEE. <https://doi.org/10.1109/FIE.2014.7044131>
- Carnevale, A. P., & Smith, N. (2013). Workplace basics: The skills employees need and employers want. *Human Resource Development International*, *16*(5), 491-501.
- "CBSE JEE Main 2016: Check out the result analysis here!" (2016, April 27). *India Today*. Retrieved from www.indiatoday.intoday.in/
- Coplin, B. (2012). *10 Things employers want you to learn in college, revised: The skills you need to succeed* (Rev. ed.). Berkeley, CA: Ten Speed Press.
- Finch, E., & Fafinski, S. (2014). *Employability skills for law students*. Oxford, UK: Oxford University Press.
- Fowler, A. (1998). *Negotiating, persuading and influencing*. London, UK: Chartered Institute of Personnel and Development.
- Gerson, S., & Gerson, S. (2014). *Technical communication: Process and product* (8th ed.). New Dehli, India: Dorling Kindersley.
- Greiff, S., Wüstenberg, S., Csapó, B., Demetriou, A., Hautamäki, J., Graesser, A. C., & Martin, R. (2014). Domain-general problem solving skills and education in the 21st century. *Educational Research Review*, *13*, 74-83.
- Hansen, R. S., & Hansen, K. (n.d.). What do employers really want? Top skills and values employers seek from job-seekers. *Quintessential Careers*. Retrieved from www.livecareer.com/quintessential/
- Holtgreive, J. (2016, August 16). Too smart to fail? *Inside Higher Ed*. Retrieved from <https://www.insidehighered.com>
- Kotter, J. P. (2013, January 9). Management is (still) not leadership. *Harvard Business Review*. Retrieved from <https://hbr.org/>
- Laker, D. R., & Powell, J. L. (2011). The differences between hard and soft skills and their relative impact on training transfer. *Human Resource Development Quarterly*, *22*(1), 111-122.
- Lakshminarayanan, R., Kumar, M., & Ramanakumar, K. V. P. (2014, May). Six sigma methodology for addressing employability issue of engineering graduates. *International Journal of Modern Education Forum*, *3*(2), 59-66. [dx.doi.org/10.14355/ijmef.2014.0302.04](https://doi.org/10.14355/ijmef.2014.0302.04)
- Leicester University. (n.d.). What are enterprise skills? Retrieved from www.2.le.ac.uk/projects/

- Llorens, A., Llinàs-Audet, X., Ras, A., & Chiaramonte, L. (2013). The ICT skills gap in Spain: Industry expectations versus university preparation. *Computer Applications in Engineering Education*, 21(2), 256-264.
- Markes, I. (2006). A review of literature on employability skill needs in engineering. *European Journal of Engineering Education*, 31(6), 637-650.
- Naipally, A., Ramachandran, H., & Smith, C. (2012). *Lifelong learning for engineers and scientists in the information age*. Waltham, MA: Elsevier.
- Nguyen, D. Q. (1998). The essential skills and attributes of an engineer: A comparative study of academics, industry personnel and engineering students. *Global Journal of Engineering Education*, 2(1), 65-76.
- Only 18% engineering grads are employable, says survey. (2014, July 15). *Times of India* Retrieved from www.timesofindia.indiatimes.com/
- Ortiz, L. A., Region-Sebest, M., & MacDermott, C. (2016). Employer perceptions of oral communication competencies most valued in new hires as a factor in company success. *Business and Professional Communication Quarterly*, 79(3), 317-330. <http://dx.doi.org/10.1177/2329490615624108>
- Puranik, A. (2015, August 8). 97% engineering graduates cannot speak English fluently: Survey. *Hindustan Times*. Retrieved from www.hindustantimes.com/
- Radermacher, A., & Walia, G. (2013, March). Gaps between industry expectations and the abilities of graduates. In *Proceeding of the 44th ACM technical symposium on Computer science education* (pp. 525-530). Denver, CO: ACM.
- Radermacher, A., Walia, G., & Knudson, D. (2014, May). Investigating the skill gap between graduating students and industry expectations. In *Companion Proceedings of the 36th International Conference on Software Engineering* (pp. 291-300). Hyderabad, India: ACM.
- Rao, M. S. (2010). *Soft skills: Enhancing employability: Connecting campus with corporate*. New Delhi, India: I.K. International Publishing House.
- Salas, E., Sims, D.E. and Klein, C. (2004), "Cooperation at work", *Encyclopedia of Applied Psychology*, Vol. 1, pp. 497-505.
- Shokri, N. M., Lin, E. Y. E., Radzi, H. M., Mokhtar, R., Ghazali, F., Muslimen, M. A., & Tarmizi, M. A. A. (2014). Communication skills: A-must-have skills for today's leaders. In *Proceedings of the 2nd Conference on Innovative Trends in Multidisciplinary Academic Research (ITMAR-2014)*. Istanbul, Turkey: Global Illuminators.
- Singh, D. (2016, February 22). Most engineering students in India lack basic skills: Varun Aggarwal of Aspiring Minds. Retrieved from www.businesstoday.in/
- Skills. (n.d.). *Business dictionary*. Retrieved from www.businessdictionary.com/
- Skills. (n.d.). *Cambridge dictionary*. Retrieved from www.dictionary.cambridge.org/
- Sommers, M. A. (2008). *Great interpersonal skills*. New York, NY: Rosen Publishing Group.
- Tricot, A., & Sweller, J. (2014). Domain-specific knowledge and why teaching generic skills does not work. *Educational Psychology Review*, 26(2), 265-283.

- Tulsi, P. K., & Poonia, M. P. (2015). Expectations of industry from technical graduates: Implications for curriculum and instructional processes. *Journal of Engineering Education Transformations*, 28(4), 42-49.
- Veres, J. F. III, & Sims, R. R. (1999). Keys to employee success: What skills are really important for success in the future? In R. R. Sims & J. G. Veres. (Eds.), *Keys to employee success in coming decades* (pp. 223-245). Westport, CT: Quorum Books.