



Emotional Intelligence: Missing Priority in Engineering Programs

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Abstract

Engineering programs in Nigerian universities, as in most African countries, are oriented towards the acquisition of technical competencies with little or no regard for emotional competencies. Data were collected through (i) interviews with fresh engineering graduates (doing the national service) and managers (who are engineers in organizations) respectively and (ii) analysis of engineering programs. The purpose of the study was to determine how the two groups perceive the criticality of emotional intelligence and engineering skills to employability, job performance and effective leadership. The findings are: while engineering graduates believe that engineering skills were more critical, managers believe that emotional intelligence was more critical; the difference was largely due to varying differences in exposure to knowledge and practice of emotional intelligence. The implication is that as current engineering programs do not include emotional intelligence they diminish the attractiveness and value of the engineering graduates; provide jobs but not careers; and do not prepare them sufficiently for a seamless transition from the classroom to the labor market and life in organizations. Actions required include the need to: situate engineering programs within a market place context, embed emotional intelligence in engineering curricula; and partner with national and multinational corporations to provide a more balanced engineering programs that are mutually beneficial to students and the market place.

Key Words: *Engineering programs, emotional intelligence, employability, emotional competencies, job performance, and effective leadership.*

Introduction

Since the Industrial Revolution, social researchers and managers of industry have consistently sought to explain why some employees are more productive or better performers than their colleagues. Elton Mayo's studies of Hawthorne Works at the Western Electric Company in Chicago between 1924 and 1927 were precisely a search for the drivers of productivity and high performance. The various theories of motivation (Maslow's theory of Hierarchy of Needs; Herzberg's Two-factor theory; McClelland's acquired needs theory and Vroom's Expectancy theory) attest to the relentless efforts to identify predictors of job performance. These theories explained individual employee job performance in terms of either inner drives or external stimulation. In the 1950s personality test came on stage but fell into abeyance for two decades precisely because it was thought to lack predictive validity.

Interestingly, it came back to life in the 1990s. The common criticism against personality tests is the possibility of “candidate faking” but Morgeson et al. (2007) thought there was a more serious issue, which was the “very low validity of personality tests for predicting job performance”.

Since the early 20th century, interest in Intelligence Quotient (IQ), a score derived from a test which assesses human intelligence, has grown as a predictor of great accomplishment and job performance. Indeed, there was a time it was believed that individuals with high IQ scores were destined to be enormously successful in life. There has also developed the controversy about its validity and utility as a predictor of job performance. While some researchers (Hunter and Hunter 1984, Schmidt and Hunter 1998) have concluded that IQ predicts job performance, others have reached conclusions that totally reject IQ as a valid predictor of performance. For instance, Cherry (2014) believes that the reason IQ has not been a successful predictor of performance is because its scores are too narrow and do not encompass the full range of human intelligence such as the ability to understand and express the role that emotions play in the success or failure of people.

Goleman (1998) who gave emotional intelligence its global popularity notes that IQ alone explains little of achievement at work or in life. He asserts that “IQ alone at best leaves 75 percent of job success unexplained, and at worst 96 percent”. Implicitly, it does not determine who succeeds and who fails”. Jensen (2012) says that although IQ is necessary it is not adequate to predict executive competence and corporate success. He cites the Research Study of Carnegie Institute of Technology which showed that 85 percent of an individual’s success was due to skills of “human engineering”, namely, personality and ability to communicate, lead and negotiate.

Goleman defines as the ability to “monitor and regulate one’s own and others’ feelings and to use feelings to guide thought action”. He explains that Emotional Intelligence consists of five basic emotional and social competencies, namely: (i) self-awareness - knowing one’s internal states, preferences, resources, and intuitions; (ii) self-regulation - managing one’s internal states, impulses, and resources; (iii) motivation - emotional tendencies that guide or facilitate reaching goals; (iv) empathy - awareness of others’ feelings, needs, and concerns; and (v) social skills - adeptness at inducing desirable responses in others. He says that the first three are personal competencies determine how we manage ourselves while the remaining two are social competencies which determine how we manage relationships. Ahangar (2012) puts it succinctly by stating that it is the ability to know one’s own emotions, manage them, recognize and understand other people’s emotions, and the ability to manage relationships in an emotion-laden environment.

Emotional intelligence has had a great impact on the management of human capital. For instance, emotional competencies are an integral component of most competency models used systematically in hiring. Traditional hiring has always tended to focus primarily on a candidate’s technical qualifications and skills but competency-based hiring is grounded in competencies necessary for success. In a study of 5,247 hiring managers from 312 public, private, business and healthcare organizations the Leadership IQ (Murphy: 2015) a global leadership training and research company, found that 46 percent of newly-hired employees were likely to fail within 18 months. The reasons for possible failure were because 26 percent could not accept feedback; 23 percent were unable to manage emotions; 17 percent lacked the necessary motivation to excel; 15 percent had wrong temperament; and only 11 percent lacked necessary technical skills. In other words, 81 percent of the failure was attributable to lack of emotional competencies. The study concluded that hiring failures could be prevented if hiring managers paid more attention to emotional competencies than technical skills.

Equally important is the effect of emotional intelligence on individual job performance. Following his research on the relationship between EI and job performance of executives Ahangar (2012) noted that individuals with a high level of EI are more likely to experience performance related success than individuals with lower levels. The reason is that emotionally intelligent people have emotional self-awareness and capability to use the knowledge of other people's emotions to deal with them, manage difficult situations and solve problems. In addition, it could also contribute to work performance by enabling people to regulate their emotions so as to cope effectively with stress, perform well under pressure and adjust to organizational change.

In a comparative cross-sectional analysis of IQ and emotional intelligence based on 300 employees selected from different organizations in the telecommunications industry in Pakistan, Gondal and Husain (2013) noted that Intelligence Quotient is not significantly related to employees' performance thus underscoring the fact that IQ alone is not sufficient for the success of employees. They therefore came to the conclusion that emotional intelligence has a significant relationship with employees' performance and that it is more important than Intelligence Quotient at the workplace. Mayer *et al.* (2008) also concluded from their research findings that emotional intelligence was more crucial in determining the outcomes of individual performance than IQ.

Research has also revealed that EI has a significant impact on leadership effectiveness. Goleman (2002) notes that leaders who have high emotional intelligence are vital to organizational success precisely because leaders should have the capacity to identify feelings and emotions of individuals in the work team to create a conducive socio-psychological environment, and gain the trust and confidence of the team. According to Glowan Consulting Group (2015: 2) "the quality that separates the most successful leaders from their peers is emotional intelligence – the ability to understand, manage and respond effectively to one's own emotions and the emotions of others". Batool (2013) posits that leaders who consistently outperform their peers not only have the technical skills required but more importantly, have mastered most of the aspects of emotional intelligence. Emotional intelligence does not resonate with transactional leadership as it does with transformational leadership. Transactional leadership generally means the ability to drive the achievement of organizational goals and performance expectations through supervision and the use of rewards and punishments. It is more task than people oriented. Transformational leadership is the ability to increase employee motivation and engagement; and enhance the capabilities, values and commitment of employees to organizational goals and corporate values.

In their study of the relationship between emotionally intelligent managers and levels of engagement among their staff, Palmer and Gignac (2012) came to the conclusion that a manager's emotional intelligence positively influences the level of engagement of their staff. Furthermore, they noted that improving the emotional intelligence of management within an organization may equally have a positive impact on its performance, capacity to retain talent and employment brand. After an extensive review of literature on emotional intelligence VanderPal (2014) posited that emotional intelligence was one of two emerging concepts that were essentially relevant to the development of efficient global leaders. The second concept is cultural intelligence.

According to Smallwood (2013) competencies that make workers in the construction industry in South Africa effective are in two categories: technical knowledge and skills on the one hand, and core competencies on the other. The core competencies comprise self-image, self-confidence, ability to handle ambiguity, personal integrity, flexibility, problem-solving, self-awareness and client orientation. He notes that the emphasis of Health and Safety enforcement

agencies is ironically on technical knowledge and skills even though core competencies (emotional intelligence) are more critical to performance in a “dynamic environment such as construction”. The construction industry employs engineers in different infrastructure projects – road, rail, ports, etc. Implicitly, emotional intelligence must be critical to performance of engineers employed in such projects. It raises the question as to the extent emotional competencies are critical to engineers.

In a study on the identification of competencies required by engineers graduating in Australia, Male et. al. (2009) found that of the 64 competencies identified problem-solving and practical engineering were the only highly rated technical competencies. Communication, teamwork, professional attitudes, business skills, problem-solving, critical thinking and creativity were perceived as “highly important”. The authors concluded that these competencies were not likely to be developed through traditional teaching methods. Research has identified other competencies which are considered necessary for the development and training of engineers. They include emotional self-control, attentiveness, emotional understanding, empathy, social responsibility, interpersonal relationships and emotional self-awareness (Chisholm, 2010).

There is a paucity of research on emotional intelligence in sub-Saharan Africa. The prevailing paradigm among the youth is that all they need in order to have a job and a successful career is a good degree or professional qualification particularly in engineering. What has emerged from the following review of research studies is that to be a well-rounded and successful employee, irrespective of the profession, the individual needs more than a university degree or technical expertise which Goleman (1998) refers to as “threshold competence”. The questions which this study seeks to answer are: (i) is emotional intelligence integrated into engineering programs? (ii) If not, to what extent does the lack of integration of EI into engineering programs affect engineering graduates’ perception of the criticality of EI to their employability, future job performance and leadership effectiveness in organizations? Employability means possession of the knowledge, skills and competencies that make an individual more likely to secure employment. This study set out to examine and compare the perceptions of fresh engineering graduates with those of managers of the criticality of emotional intelligence to employability, job performance and effective leadership at national and global levels in organizations.

Methodology

Emotional intelligence is crucial to the success of every profession be it engineering, law, medicine, pharmacy or teaching. As a matter of fact, it is necessary for family life, community life and team work in organizations. Why is Engineering, therefore, the subject of this study? First, according to Ignatius (2014, 50) twenty-four of Harvard Business Review’s 100 best performing Chief Executive Officers in terms of market capitalization of their companies, “have undergraduate or graduate degrees in engineering”. Part of the explanation is that engineering breeds an ethos of building things that work and it teaches people to try to do things efficiently and eloquently with reliable outcomes. Unfortunately, the author completely ignored the human and social skills which are so vital to effective and efficient management and leadership of global organizations! Second, in careers where professional selection focuses almost exclusively on intellectual abilities, emotional intelligence carries much more weight than IQ in determining who emerges as a leader (Goleman, 1998). Third, there is an amazing growth of interest in engineering among African youth because it is believed to guarantee employability more than social sciences and humanities. Finally, unlike the medical profession, engineering appears slow

in adopting an approach that demonstrates its recognition of the need to be context-driven and to integrate emotional intelligence into its curricula.

In carrying out this study, data were gathered over a period of three years, in 2011, 2012 and 2013 from different sources. Data were obtained through interviews conducted in Nigeria among engineering graduates who were participating in the National Youth Service Corps program. Data collection took advantage of the unique assemblage of the engineering graduates in one location at the orientation camps to conduct interviews with them. A total of 265 engineering graduates were interviewed during the 3-year period. They were from a total 35 (31.2%) of the 112 universities in the country. They had no formal exposure to emotional intelligence. The interview was structured.

A structured interview was also conducted among 72 managers randomly drawn from various companies in construction, telecommunications, information technology, flour mills, manufacturing, breweries, oil and gas and automobile dealership. Respondents have degrees in different fields of engineering and have a minimum of eight years of work experience, and also exposure to emotional intelligence through either training or coaching on the job. The purpose of the interviews for both groups of respondents was to determine their perception of the criticality of emotional intelligence to employability, job performance, and leadership effectiveness. Besides the interviews, there was a careful review of the philosophy, objectives and curricula of some engineering programs. The analysis of the data produced the following findings.

Findings

The findings of the study are in two parts. The first part presents the nature of the programs and demonstrates that they are largely technical and bereft of emotional intelligence learning. The second part presents the perception of engineering students to employability, job performance, and leadership effectiveness.

There is a strong emphasis on the acquisition of technical engineering skills in all the various engineering programs: chemical, electrical/electronics, civil, mechanical, computer, petroleum, biomedical, agricultural, polymer and textile, materials and metallurgical, food, etc. This is evidenced in the philosophy, objectives and curricula of the engineering programs. Although the philosophy of engineering education varies from university to university, the common denominator is the commitment to: (i) meet the country's aspiration to be technologically developed; (ii) produce engineering professionals who are equipped to face the technological challenges of the industrialized society; and (iii) produce graduates of high and internationally acclaimed academic standards, who would be of value to the nation.

The various engineering programs have specific objectives which can be classified into the following categories: (i) Excellence in engineering design, development, production and maintenance of devices and products; (ii) Application of engineering principles with a view to providing solutions to societal problems; and (iii) Production of world-class engineering graduates with strong background in theory and practice, and who will meet the technological challenges of the future.

The engineering programs generally consist of four components and the duration is 4-5 years. The components are as follows:

- Applied Sciences, Mathematics and engineering technology: There is no evidence that emotional intelligence was a component of the curricula taught in any of the universities even though some of them intend to produce graduates that are “highly motivated” and would “have a capacity for

leadership, inclusiveness and teamwork”. Paradoxically, the teaching of these competencies is not embedded in the curricula of the programs.

- Practical hands-on projects aimed at deepening engineering knowledge and acquiring skills pertinent to the specific field of engineering.
- Internship or industrial placement consists of periodic placement in organizations. It provides engineering students hands-on experience that may not be available within the university facilities or environment. The Industrial Training Fund (ITF) actively supports the internship program by encouraging private organizations with tax incentives, and monitors the effectiveness of the program.
- End-of-course project which enables the students to independently develop, under the supervision of a faculty member, a creative product that is submitted as part of the requirement for the award of the engineering degree.

The exclusion of emotional intelligence in engineering education borders on reductionism in which the profession is simply defined and taught narrowly in terms of technical capacity and without much regard for the dynamism and realities of social relations and the market place. It deprives the students the possibility of having a rich and broader perspective of their role as engineers.

The engineering programs put a high premium on professionalism as evidenced by the focus on not only technical competence but also (i) professional ethics; (ii) optimum service to the community or society; (iii) habits of industry, thoroughness, orderliness and accuracy; and (iv) lifelong learning after graduation in recognition of the rapid change in engineering technology in a global system. The professional orientation is consistent with the engineering philosophy of contributing to the development of society or community in which graduates will operate.

A major finding is that formal engineering programs do not provide for the learning of emotional intelligence but they unwittingly do provide an opportunity and space for informal and unstructured learning of emotional competencies. For instance, projects were given to groups of students to test their cognitive capability and technical skills. The group projects provided a unique situation analogous to a work environment in which as engineering students they had a common objective. It was a situation of both conflict and cooperation in which they could not succeed without inter-dependence or team work; they could not get the project going or completed without some form of leadership and communication. It was a situation in which disagreement and compromise were inevitable; and in which the failure of one member to enact his/her role could affect the outcome of the group’s project. Table 1 presents the responses to the question: “what is the most important competency you learnt during the group project?” “Practical application of engineering theories and models” has the highest response of 21 percent. However, out of the six competencies they learnt from participating in the group projects, five of them were emotional competencies.

Table 1: Competencies learnt informally in group projects

Response	No. of Respondents	Percentage
Practical application of engineering theories and models	55	21%
Teamwork - it is better than working alone	48	18%
Communications	45	17%
Trust	40	15%

Dependability	40	15%
Influencing – ability to persuade or convince colleagues	37	14%
	265	100%

Findings from participation in the internship program were even more revealing. Unlike a group project, only one student usually got a placement in a facility or department in an organization outside the university. For the period of the placement, which was generally between one and three months, the student was assigned a supervisor, expected to abide by the rules of the organization. He/she was systematically coached or guided in the performance of the tasks assigned. Quite often, the internship was the student's first experience in a formal organization and was completely different from a learning institution. Table 2 presents the responses to the following question: "What is the most important competency that you learnt during your internship program?" The responses are an interesting finding and demonstrate the need for a linkage between learning in the classroom and in the workplace.

As interns they learnt that, unlike in the class room, there was greater emphasis on behavioral characteristics than on intellectual capacity of the employee. Trustworthiness, integrity, self-management, teamwork, communication, focus on the clientele, mutual respect, initiative and drive were considered vital for performance and success. This organizational culture was manifested in the engineering graduates' responses. Of the eight categories of responses distilled from the structured interviews six of them were in the realm of EI. Informally, the interns learnt new competencies although 17 percent of respondents still believed that their technical skills were paramount. The new competencies that they acquired informally were emotional competencies but were yet to be internalized as evident by responses to subsequent questions on the comparative criticality of engineering skills and emotional competencies.

Table 2: Competencies learnt informally in internship

Response	No. of Respondents	Percentage
Practical application of theories and models	45	17%
Teamwork	42	16%
Interpersonal relations	40	15%
Trustworthiness/integrity	34	13%
Communication	32	12%
Client Orientation	27	10%
Self-Management	24	9%
Client orientation Compliance with operating standard procedures	21	8%
	265	100%

The fresh engineering graduates had a checkered knowledge of emotional intelligence which was acquired through informal learning during both the group projects and industrial placement. This accidental type of learning does not equip them with a firm grasp of the concept and practice of emotional intelligence which they need for transition from the classroom to the world of work. The finding is consistent with the finding of Flowers' study (2005) which showed that although emotional competence was critical for premedical and medical students, they "were inadequately prepared" by their education and training for the use of emotional competence necessary for their profession.

The second part of the findings (Table 3) focuses on how engineering graduates and managers perceived the relevance of EI to employability, job performance and leadership effectiveness. The two groups were asked to indicate whether emotional intelligence or engineering skills were more critical to (i) employability; (ii) achieving high performance on a job; and (iii) effective leadership. The engineering graduates consistently demonstrated in their responses that engineering skills were more critical than emotional intelligence. In contrast, managers believed that emotional intelligence was more critical in all three spheres. Further probing showed that engineering skills were considered critical by some managers for employability for only fresh graduates who were being employed for non-supervisory jobs. Although the common response of engineering graduates and some managers on the criticality of engineering skills is consistent with Goleman’s assertion that technical skills were threshold competencies for employment, research has shown that emotional intelligence has a critical role in employability.

Table 3: Criticality of engineering skills versus emotional intelligence

Areas of Study	Engineering Graduates			Managers		
	Engineering Skills	Emotional Intelligence	Don't know	Engineering Skills	Emotional Intelligence	Don't know
More critical to securing employment	96%	3%	1%	24%	76%	0%
More critical to achieving high performance on a job	81%	17%	2%	11%	89%	0%
More critical to leadership effectiveness	69%	30%	1%	12%	88%	0%

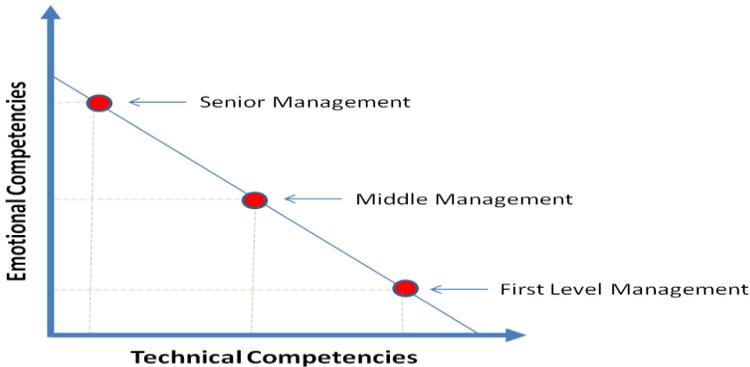
In their study of post-graduate students in South Africa, Potgieter et al. (2013) found that emotional intelligence is significant in explaining their employability attributes – confidence in their career self-management, self-efficacy, career entrepreneurial orientation and proactivity. In a similar study of students in an Indian higher education institution Varghese et al. (2013) found that career meta-competencies such as adaptability, self-knowledge, and a sense of purpose, self-esteem, and career orientation awareness had direct and significant influence on employability.

Another reason emotional intelligence is crucial to employability is that, millennials are no longer limiting their employment search to their home country or even continent. In the face of palpable unemployment they are open to and indeed frantically search for employment abroad. Allan et. al. (2008) noted that combining global competencies with technical education “makes engineering graduates much more acceptable to the labor markets”. Hawkins (2014) rightly observed that the increased willingness to be employed in different countries comes with the responsibility to be fully prepared to “be multi-culturally sensitive global leaders”. If EI is crucial to employability engineering students must acquire emotional competencies while in the universities. The American Institute for Research (Dymnicki et al.: 2013) is in the vanguard of assisting policy makers in the USA to better understand how social and emotional learning (SEL) can help students to be college and career ready. According to the German Continental AG (2006) Georgia Technology Institute, Massachusetts Institute of Technology, University of Tokyo and a few others are seeking to produce global engineers who are technically adept, culturally aware, and broadly knowledgeable, as well as innovative, entrepreneurial, flexible, and mobile.

On relevance of EI to job performance research is also on the side of managers in the study - validating the fact that EI plays a critical role in job performance (Goleman, 1998; Ahangar, 2012; Gondal and Husain, 2013). Even where engineering skills may earn engineering

graduates jobs, their technical skills alone cannot guarantee star performance and a successful career. Emotionally intelligent engineers are better placed to solve problems because they are more competent in integrating technical and emotional considerations when analyzing and making optimal choices (Riemer: 2003). Palmer and Gignac (2012, 10) believe that EI is an “increasingly validated predictor of job performance,”

Figure 1: Leadership/Managerial Requirements and Emotional Intelligence



The importance of technical skills diminishes (as shown in figure 1) as the individual progresses up the career ladder or executive hierarchy. In contrast, emotional competencies become more critical for success at the leadership and global executive levels. Ahangar (2012) notes that EI is the “most potent factor of job performance among executives”. Hence, employers provide training in such areas as team building, multicultural relations, communications, leadership, self-management, influencing people, etc. to complement the technical skills.

Emotional intelligence also influences leadership capability. As the managers in the current study noted, the assessment of employees’ progress and potential for higher responsibility are no longer based on only technical capability but largely on non-technical capabilities. The determination of who are qualified for a promotion or an external assignment is a function of who possess the most appropriate emotional competencies for the position. Traditionally, the study of emotional intelligence has been linked to job performance and leadership. Various findings (Goleman, 1998; Zafra et. al, 2008; Austin, 2010; Ahangar, 2012; Palmer and Gignac, 2012) have demonstrated that emotionally intelligent individuals are more effective leaders. The reason is that they have the ability to: develop and lead a closely-knit and high-performing team; motivate people to achieve results; create a supportive and enabling work environment for colleagues and reports; and are predisposed to transformational leadership style. In fact, Goleman et. al (2002) noted that the success of 79 percent of leaders in the United States of America was attributable to the possession of emotional competencies.

Conclusion

This study shows that fresh engineering graduates believe that their engineering skills are more critical than emotional intelligence to their employability, job performance and leadership capability. They were not taught emotional intelligence throughout their engineering programs. The only exposure they had was through informal and unstructured learning during project work and industrial placement. The learning was not internalized. In contrast, managers who are also engineers have a different perception. To them emotional intelligence is more critical. The

difference emanates from the fact that while managers have had training or exposure to emotional intelligence the engineering graduates have not had such experiences. In all cases, managers have had experience using emotional competencies in recruiting, training or career development in their organizations. Cognizant of the business imperative for incorporating emotional intelligence into engineering education, the following steps would need to be taken to redress the current situation.

Rethinking: There must be a shift in thinking or mindset among university faculty, private sector executives and students about the relevance of the current engineering programs to the labor market, the society and global economy. A rethinking means the universities would have to design programs that aim at educating students for employability, job performance, careers and entrepreneurship. Such programs have to be context-driven, compatible with dynamic market place realities, and inspired by the need to educate engineers “not only for today but also for tomorrow, and not for one country but for the globe” (Elegbe, 2010).

Universities-Market Partnership: Universities must seek to analyze and understand national and international business environments respectively. Competencies which are usually considered necessary for high performance and effective leadership in organizations must be identified. Inter-generational work place keeps changing, thereby stressing the need for acquisition of emotional competencies. To fully understand the business context and the needs of stakeholders, engineering faculties need to establish communication and partnership with private sector organizations which operate both domestically and internationally. For now the two parties operate in silos. The silos must be removed to have a meaningful dialogue on what engineering education must produce for the stakeholders.

Engineering faculties must identify the competencies needed in the ever-changing labor market, while the private sector needs to support engineering programs to produce the right kind of skills for the market place and society. The involvement of corporations is particularly critical because they would bring their local and global experience to bear on the review of the curricula and thus ensure its compatibility with the realities of the market place.

Curriculum review: A change in curricula should begin with a paradigm shift in engineering faculties. They have to recognize and accept the importance of EI to be able to effectively mainstream it into engineering curricula. Resistance to change could stand in the way of a paradigm shift. The change is essentially the integration of EI into the curricula. Emotional intelligence should be mainstreamed into course structures and projects, and not taught as a stand-alone course. Isolating EI as a separate course will rob it of practicality and application to life situations, and its purpose will be lost on the students.

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