CHAPTER 2

REVIEW OF LITERATURE

2.1 INTRODUCTION

An ultimate and ideal situation for both the institute and the industry is to go in perfect synchronisation. There is a persistent conflict over the requirements of the industry for engineering graduates with the tangible competencies they have acquired during their academic pursuit. Many studies have been reported in this vicinity from various countries including India. The present investigation is designed to identify and analyse these skill requirements as they exist among the graduate engineering students, and it explores several issues of direct relevance to this study - industry needs, graduate engineers’ technical skills and soft skills.

The reviews presented in this chapter are drawn from previous studies reported by researchers on the industry requirements, job skills and professional skills. The reviews comprise Indian and foreign studies on the topic of the present exploration. The analysis covers current literature that includes a variety of sources:


2.2 EXPLOSION OF MAJOR PLAYERS

Due to the expansion of many permanent companies and business concerns across the country and abroad, the focus is more on the skilled employees, and hence the need for human resource development is increasing day by day. The industries are looking for skilled and hardworking people
who can give their best to organisations. Hence, a greater understanding about 
employability, soft skills, mentoring programme and rubrics is needed.

A report released by National Association of Software and Services Companies (NASSCOM 2009) titled ‘Perspective 2020: Transform Business, Transform India’ shows that India has the highest population of about 750 million people in the working age group; this would go up to 920 million by 2020. It is this major group which contributes to the firm progress of India. But if this escalation has to be sustained, it is possible only if education provides the right support in the required field. The National Knowledge Commission (NKC 2009) in its report has outlined the need for developing the education system in India. Among the many recommendations given, one important factor is to enhance the skills of the graduates in view of their employment.

According to FICCI’s (Federation of Indian Chambers of Commerce and Industry) Secretary, Didar Singh, (2014), it is not just for the economic benefit that India must provide the skill set to its young population; it must do so for social reasons. The aim should be to create quality and productive employment opportunities. As per the National Skills Mission, 500 million professionals would need to be skilled by 2022, to make them employable, (NASSCOM 2014). There is a general consensus that employability does not refer to just seizing the opportunity, but to a wide range of attributes and competencies that enable the job seekers to gain and sustain their employment.

2.3 EMPLOYABILITY

2.3.1 Definitions of Employability

Employability is every future engineer’s ultimate goal and professional colleges are building their efforts in equipping such skill sets among the students. University of Exeter (Lees 2002) considers employability
as the establishment of clear mechanisms by which students can develop their abilities to use and deploy a wide range of skills and opportunities to enhance their own academic learning and enable them to become more employable. Employment and employability are not the same and they should be differentiated. Harvey (2001) mentions in his report titled ‘Employability and Diversity’ that employability has many definitions, but they break down into two broad groups. The first relates to the ability of the student to get (and retain and develop in) a job after graduation. The other set is concerned with enhancing the students’ attributes (skills, knowledge, attitudes and abilities) and ultimately with empowering the student as a critical lifelong learner. Most employers are looking for graduates, who are proactive, and can use higher level skills like analysis, critique, synthesis and multi-layered communication to facilitate innovative teamwork in catalysing the transformation of their organisation. Employability not only depends on whether one is able to fulfil the requirements of specific jobs but also on how one stands relative to others within a hierarchy of job seekers (Phillip Brown & Anthony Hesketh 2002).

Being employed means possessing a job, and comprising the qualities to maintain employment and progress in the workplace. From the employers’ perspective ‘employability’ appears to refer to ‘industry readiness,’ that is, possession of the skills, knowledge, attitudes and better understanding that will facilitate graduates employable. A study by Kubler & Forbes (2005) suggests that employability embraces certain levels of cognitive skills, generic competencies, personal capabilities, technical ability, business/organisation awareness, and critical evaluation, reflection and review abilities. It is challenging to use an extensive framework for employability taking into consideration the roles of both individual characteristics and job market conditions. The model developed by McQuaid
& Lindsay (2005) contains three interrelated components that influence employability:

- **Individual factors that include attributes** (Basic social skills), competencies (Motivation, confidence), transferable skills (Literacy, numeracy, problem-solving, communication, adaptability, team working skills), qualifications and educational attainment.
- **Personal circumstances that relate to the individual’s social and household circumstances** (Family and caring responsibilities, access to resources).
- **External factors that cover labour demand conditions** (Macroeconomic factors, vacancy characteristics, recruitment factors) and enable support factors (Accessibility to public services and job-matching technologies).

Further, Clearly et al. (2006) define employability skills as follows:

i) **Basic/fundamental skills**: technical, knowledge of the task, hands-on ability

ii) **Conceptual/thinking skills**: planning, collecting and organising information, problem-solving

iii) **Business skills**: innovation and enterprise

iv) **Community skills**: civic and citizenship knowledge

v) **People-related skills**: interpersonal qualities, such as communication and teamwork

vi) **Personal skills**: attributes such as being responsible, resourceful, and self-confident

Since the concept of employability has changed recently, employability skills are considered the basic skills necessary for getting and remaining in a job and performing well in a given role (Vijayalakshmi Rao 2010). Mantz Yorke (2006) views employability as a set of achievements, skills, understandings and personal attributes that make graduates more likely to gain employment and be successful in their chosen occupations, which benefit themselves, the workforce, the community and the economy.
2.3.2 Empirical Studies on Graduate Employability

Rao (2014) in his Ph D research found that there must be effective coordination among faculty, students, industry and directors of educational institutions for enhancing employability skills among students. He emphasises on the role of Training and Placement Officer (TPO) in the educational institutions for better employability and calls for promotion of finishing schools to enhance employability.

Paranto and Kelker (1999) have analysed employers' satisfaction with job skills of business college graduates in a regional University in the US. They have examined the skills which the employers perceive as important when hiring business graduates. 346 employers have been identified in the survey by the University's placement office. They are mostly in rural areas in the upper Midwest of the US and hired business graduates during the 1990-94 period. 136 employers have responded (39% response rates). By using factor analysis, 18 variables (skills) have been reduced to four major factors, namely specific skills, core skills, personal characteristics, and communication skills.

NCVER (National Centre for Vocational Education Research, 2003) has conducted the study and has suggested that the best practices for fostering generic and soft skills development in the workplace include:

- Make generic skills a key feature in job descriptions and recruitment process
- Use a range of ways to help familiarise employees so that they learn what the organisation expects in terms of key employability skills, standards of work and the key attributes it expects of its employees
- Model the behaviours sought
- Use mentoring approaches
• Use rotation of tasks or working at higher duties where relevant
• Use relevant, targeted training for workplace supervisors to help them develop employability skills in their employees
• Use employees or teams for role play
• Use quality circles and improvement teams to examine processes and other issues in the industry
• Use work-based projects to assist the development of employability skills
• Use staff assessment and the performance management system to reflect on these skills
• Use critical circumstances, including dealing with mistakes, conflict resolution or performance problems
• Involve employees in appropriate community projects.

Noel-Levitz (a higher education consulting firm) and Utah State University have developed a comprehensive and well-designed instrument for employer satisfaction surveys. The objective of the survey has been to measure the employer satisfaction for benchmarking purposes (Kleinke, 2005). Seventeen universities have participated in the survey and the survey instrument has been mailed to 297 employers of the graduates, of which 112 employers have responded (38% response rate). The questionnaire focuses on graduates' knowledge, general skills, and specialised skills. Employers have rated graduates' knowledge and skills on a five-point scale in two aspects: satisfaction with the specific skills of the graduate and the importance of each of those skills. The survey has found that the employers have been on an average very satisfied with the knowledge and skills of the graduates (average rating of 4.0 on a five point scale). The survey instrument has been found
useful, because the questions are based on the both the importance and satisfaction levels of knowledge and skills. This structure has been incorporated in the present survey instrument.

The expected student learning outcomes of both ABET and the National Board of Accreditation (NBA) in India are similar due to the common membership of the so-called Washington Accord (2007), which mutually recognises engineering degrees across 12 member-countries. Since many questions in the employer survey of the study have been drawn from the NBA’s learning outcomes, the survey results are to some extent comparable with the above study’s outcomes. Lattuca et al (2006) have surveyed 1,622 employers. The employers have been asked for information on the characteristics of desired employees and three basic issues: (i) the preparation of recent engineering graduates, (ii) whether or not the skills of the graduates had increased, and (iii) the importance employers attach to each of the 11 EC2000 learning outcomes. The study has found that the majority of the employers have agreed that, overall, the graduates have adequately or well prepared for the profession. Further, many employers have reported that the skill set of the recently hired graduates have improved compared to those in the 1990s, in particular for so-called soft skills.

The Academy for Education Development (AED, 2008) has carried out an employer survey in Egypt, with the objective of providing recommendations to the Ministry of Higher Education on how to improve the quality of middle technical college graduates. A sample of 240 companies has been selected based on stratified sampling technique (by size: small, medium, and large). AED has sent surveyors, to companies for personal interviews. 92 companies have fully completed the survey questionnaire (38% response rate). The survey has found that the level of skills demanded by employers has increased, mainly because of: (i) higher levels of technology, (ii) increasing competition, and (iii) increasing concerns about the quality of
products. The survey has also indicated that the companies prioritise soft skills, including personality (honesty, punctuality, etc.) and what they have labelled as basic skills (literacy, problem-solving, management, etc.). The AED’s employer survey has been especially helpful for our employer satisfaction survey to determine relevant questions about employer characteristics. Data availability on employers' characteristics has enabled us to scrutinise the survey results disaggregated by employers’ characteristics. Sujith Kumar (2011) lists out, positive attitude, analytical and logical reasoning skills, good communication skills, interpersonal skills and the flexible approach and a global mindset as the basics that the organisation looks for in the new recruits.

2.4 SOFT SKILLS

2.4.1 Definition

Soft skills are essential professional skills and these are also known as the non-technical, intangible, people, corporate, emotional intelligence, employability, life, generic, key, essential and transferable skills. These skills are linked with one’s ability to complete specific tasks successfully and to complement personal traits, mental power, values, and self-image which portray one’s effectiveness and success in their career (Boyatzis 1982; Brown 1994). A more comprehensive definition is given in the context of corporate human capital management whereby soft skills are seen as traits that motivate effectiveness or excellent work performance (Otter 1995).

James and James (2004) accept that soft skills distinguish certain career attributes that individuals may possess like the ability to work on a team, communication skills, leadership skills, customer service and problem solving skills. Soft skill is also defined from the viewpoint of cognitive elements in the non-academic aspects such as positive values, leadership qualities, teamwork, communication skills as well as lifelong learning
Malaysian Higher Learning Institution 2006). Another definition encircles the presence of soft skills either in the individual aspect, within a system or in a group (Erik & Piet 2007]. Such traits are only identified in specific work tasks. Thus, it is pertinent to note that soft skills correlate with measuring work performance according to acceptable standards. It is developmental: from early stage into the higher stage as well as expert stage, which can be diversified in various situations.

Soft skills complement hard skills, which are the technical requirements of a job. Soft skills are as important as cognitive skills (John 2009; Zehr 1998). Researchers define soft skills in a different way that traditional skills like being a good team player, a firm leader or a brilliant negotiator do not seem to be effective anymore. To really set out, one need to be doing something different and something better which requires qualities or traits is known as soft skills.

In conclusion, the various definitions pronounce that soft skills are crucial to enhance and increase the performance level of a student to develop the current as well as future needs of industry and businesses.

2.4.2 Background

The career management consultant Challa Ram Phani (2007) has published an article titled “The top 60 soft skills at work”, listing and discussing 60 skills which, according to his study are “the personality traits and skills that employers state are the most important when selecting employees for jobs of any type”. Among these 60 soft skills, over 40 of them are essential for technically talented people who excel in their professions.

The basis of soft skills is referred by various authors and employers as (Malgorzata Pinkowska 2011): Critical skills (Lee et al. 1995), Soft factors (Caupin et al. 1999), Personal skills (Murch 2001), Interpersonal skills (PMI
2004), People skills (Flannes 2004), Soft factors (Wohlin 2005), Key skills (Simpson 2006), Human skills (Pant & Baroudi 2008) and Social skills (Alam et al. 2010). These terms of soft skills are meant as non-technical skills by the researchers initially. They use the terms to describe the personality traits of the individuals consequently. Soft skills are those skills-over and above, the technical knowledge and expertise in the chosen field required for an individual to relate to and survive and succeed in his or her environment (Gopalswamy Ramesh & Mahadevan Ramesh 2011). They also build and sustain effective relationships that will result in mutual gain.

2.4.3 Importance of Soft Skills

As employers are progressively looking for employees who are mature and socially well adjusted, they rate soft skills as number one in importance for entry-level success on the job (Wilhelm 2004). Since soft skills are critical for productive performance in today’s workplace, current and prospective business leaders are emphasising the development of soft skills (Nealy 2005). While technical skills are a part of many educational curricula, soft skills need further emphasis in the University curricula so that students learn the importance of soft skills early in their academic programmes before they embark on a career (Wellington 2005). Also, soft skills increase the performance level of a student to meet the current as well as future needs of industry.

Soft skills are character traits that enhance a person’s interactions, job performance, and career prospects (Parsons 2008). Another study indicates that hard skills contribute only 15% to one’s success, whereas 85% of success is due to soft skills (Watts & Watts 2008). Weber (2009) reveals that soft skills as interpersonal, human, people or behavioural skills which are needed to apply the technical skills and knowledge in the workplace. Soft skills refer to personalities, attributes, qualities and personal behaviour of
individuals. Soft skills include certain abilities such as communication, problem-solving, self-motivation, decision-making, and time management skills (Gupta 2009). Realising the importance of soft skills, several studies have also emphasised the point that these skills should be embedded in the curriculum, thus making it easier for students to acquire them (McEnrue et al. 2009; Howe 2010).

A study has found that 75% of long-term job success depends on people skills, while only 25% is dependent on technical knowledge (Klaus 2010). The outcomes of soft skills training are often intangible and provide gradual or deferred returns (Onisk 2011). While employers exceedingly want new employees to possess soft skills, the hard and soft skills must complement one another (Marcel 2012). To survive in the globalised world, one is expected to update oneself with both the latest advancements in technology and current affairs.

Dhanavel (2010) focuses on culture-bound soft skills like emotional intelligence, assertiveness, adaptability, etc. He suggests to students of a professional education that reading literature will help acquire these skills. He has taken excerpts from Indian and foreign novels and has introduced many characters for a better understanding of various soft skills. There are many advantages in using literary genres like stories, novels and poems for imparting soft skills to the students. As the conventional method of teaching will serve only to the minimum, using literature can serve as an immense source for the students to explore different vocabularies, linguistic uses and forms because the learner comes to know about the people, social background, customs, thoughts, feeling and culture of that particular country and age (Vijayalakshmi & Renuga 2012). Literature can serve as a great source for the students to know about the people, social background, customs, thoughts, feeling and culture of countries and period. This exposure will
enhance their knowledge and surface way for the effective acquisition of soft skills.

2.5 DESIGNING ASPECTS OF SOFT SKILLS CURRICULUM

Albert P’Rayan (2008) suggests that the existing Engineering English course offered at the colleges affiliated to the Anna University is very much examination oriented and there is a wide gap between students’ final examination scores in English and their proficiency in the target language. Padmini (2012) exhorts to gear up the engineering education system through innovative initiatives. The respondents have indicated ways in which the presentation material can be improved. Their suggestions include more digital materials, minimise theoretical and linguistic approaches, familiar to specific disciplines and remove repetitions. Nitin & Mamta (2012) suggest that “Exercises, practice situations and role-plays will be instrumental in developing the personality of the students”. Therefore, it is most important that the engineering colleges need up-to-date knowledge and skills to design, implement and deliver new curricula.

2.6 COMMUNICATION SKILLS TRAINING

Lakshmi Narayanan (2007), the Chairman of NASSCOM, implies that the teachers of English at engineering institutions should undergo a paradigm shift and cease to be mere teachers of grammar and structure; they are expected to play the role of communication and soft skills trainers. According to Fatn Aliah Phang & Khairiyah Mohd Yusof (2013), the 21st Century provides a myriad of challenges, such as rapid development, economic turmoil, and fast-changing technological advances, the energy crisis, the borderless world and many more. Faced with these challenges, just as ‘business as usual’ cannot work anymore, and it is the case that ‘education as usual’ cannot help us to produce the required manpower and leaders. According to Renuka Devi (2013), almost all engineers need to work with
technical drawings, discuss dimensions and tolerances, talk about different materials and their properties, describe the shapes of components and how they fit together, describe causes and effects, explain technical problems, etc. Equipping engineering students with the skills for specified outcome such as effective communication and teamwork requires teaching and assessment methods not traditionally found in engineering education and unfamiliar to most engineering educators (Felder & Brent 2003). According to Sumit Prasad (2011), the training system is the concept of broadening the horizon of an individual; training is an instructor-lead, content-based intervention leading to the behaviour of an individual.

Teachers involved in this kind of exposure to industrial training activity enhance the competencies that are critical for a successful teaching performance. This strategy for applying industrial associations for training purposes is a systematic approach to impart learning and ensure development in authentic environments to improve individual, team and organisational effectiveness (Kraiger & Ford 2007). Cort et al. (2004) contend that practical training periods in companies allow teachers to update their skills and knowledge in the subject areas they teach, encourage them to experiment with new teaching methods and materials, give them a realistic and holistic impression of the professions and bring elements of realism into their teaching. Especially, communication skills training refers to the training in different aspects and levels of language skills that enhance an individual's interactions, job performance and career prospects.

Vicky et al. (2011) have studied the teaching of communication skills using role play and concluded that the key to successful teaching of communication skills include: assessment of the learner; assessment of the group; the educator’s ability to create a safe learning environment; the educator’s ability to provide constructive, goal-directed feedback; and
cultivating the ability of the learners to reflect on the processes of communication.

**2.6.1 Apprehensions of Imparting Soft Skills to Students**

Soft skills are personality traits and non-academic skills and these skills cannot be taught or learnt like academic subjects. The SCANS Report (1992) lists critical skills and urges educators to incorporate workplace readiness skills into existing academic programmes. Some of the skills listed include personal qualities like decision-making, responsibility, reasoning, initiative, self-management, honesty, and integrity in addition to communication and computation. Goeran (2002) states that we (English teachers) should try to do our best in achieving two results simultaneously that are vital in view of the ever-changing face of English: to enhance our students’ linguistic competence, and to prepare them for handling the extra-linguistic demands via soft skills. A soft skill trainer, therefore, before organising any group activity, can always think of preparing and encouraging constructive controversy in a classroom which will initially ensure the participation of the students in the class and accept each other’s opinion.

**2.6.2 Teamwork**

According to McEwen (2008), the twenty-first century teachers are surrounded by electronics; furthermore, they must be prepared to utilise these technologies to reach and stimulate their students. Students will gradually learn the value of group work. It will reduce the strenuous nature of the attempts made by individuals and will make them work in teams. The issue is that the higher education today focuses on syllabi alone and industries look far beyond what a curriculum is capable of teaching like communication and creative skills, and team skills. Most researchers and employers articulate about this issue on different forums.

**2.7 SOFT SKILLS IMPROVEMENT AND MENTORING**

In contemporary times, mentors have played a vital role in the development of individuals in education and business organisations.
Mentoring for a professional career has been a topic of research even in the mid-1970s. Kram’s (1985) mentor role theory has provided the basis for much of the research conducted on the topic. In the theory espoused by Kram, mentoring can be categorised as a career or psychosocial activity. Career mentoring functions include sponsoring professional advancements and overseeing career preparation within an academic setting, coaching the protégé, protecting the protégé from opposing forces, presenting challenging assignments, and increasing the protégé’s exposure and visibility.

In higher education, Lyons et al. (1990) have found that mentors not only transmitted formal academic knowledge and provided socialisation experiences into their chosen discipline, but also bolstered the students’ confidence and professional identity, giving them a vision of the identity they might one day achieve. Caffarella (1992) defines mentoring as an ‘intense caring relationship in which persons with more experience work with less experienced persons to promote both professional and personal development’. Mentoring helps in important transition such as coping with a new situation like a fresh job or a main change in personal circumstances or in career or personal growth.

There is no universal definition on mentoring. However, it appears that terms such as facilitate, assist, help, and reciprocity seem to describe this ancient term that was first predicted in the classical vision of Odysseus (Smith & Wright 2000). Mentor was a faithful friend of the Greek hero Odysseus in Homer’s epic story The Odyssey. When Odysseus left for war, Mentor was left behind to serve as a tutor to his son, Telemachus. Mentor served in this role, earning a reputation for being wise, sober, and loyal. The classic understanding of the term “mentorship” evolved from the relationship between these two characters.
An ethic of care enacted by mentors as they monitor their protégé’s progress is found in many mentoring relationships (Buell 2004). Mentoring is viewed as a series of meaningful interactions between a more experienced person, identified as the mentor, and a protégé that enhances the protégé’s personal growth and professional advancement (Green & Bauer 2006). First, mentoring is an intentional process. Second, mentoring is a nurturing process that fosters the development of the protégé towards his full potential. Third, mentoring is an insightful process in which the wisdom of the mentor is acquired and applied by the beneficiary (Wong & Premkumar 2007). Mentors facilitate students’ learning by providing or highlighting appropriate learning opportunities, assessing the students’ practice and taking responsibility for identifying the achievement of the prescribed or negotiated outcomes. Coaching and mentoring are similar. Flexible methods of development are based on the use of one-to-one discussion that aims to enhance an individual’s skills, knowledge or work performance. They are characterised by a willingness to listen, openness to new ideas, enthusiasm and encouraging individuals to become involved in innovative work experiences.

Over the last 20 years, professional coaching and mentoring schemes have become popular methods to support learning and career development amongst new recruits, graduates and potential business managers (University of Wolverhampton 2010). Soft skills are imparted through either training or sharing experiences. It can be done through role playing and networking with experienced contemporaries who act as mentors (Baher 2010).

According to Chartered Institute of Personnel and Development (CIPD 2012), coaching and mentoring programmes are activities that can be considered as part of the spectrum of ‘talent management’ because they either focus on developing specific new skills that benefit the individual and the company (coaching) or they help individuals develop new ways of thinking to
overcome obstacles and enable them to progress in their career through a relationship with a more experienced individual (mentoring). Jenni Jones (2012) has investigated the perceptions of mentees and mentors during the learning process and the factors that contribute to this learning within formal mentoring relationships. The results are presented within four categories of learning: cognitive, skill-based, affective-related learning and social networks. They demonstrate the changing scope of learning as process and product and the impact of moderating factors on the mentoring relationships. Organisations use a variety of methods to develop talent and produce high performing employees.

Mentoring is typically a one-to-one relationship between a more experienced and a less experienced employee which is based upon encouragement, constructive comments, openness, mutual trust, respect and a willingness to learn and share (New South Wales Public Service Commission 2014). Cox et al. (2014) have highlighted on the theoretical foundations of mentoring and developed a structural analysis of the coaching engagement to indicate the potential interplay between organisational and individual agendas and to help Human Resource Development (HRD) professionals become better informed about the value of mentoring in the context of wider HRD paradigms.

2.8 COMMUNICATION SKILLS ASSESSMENT AND RUBRICS

This section reviews a selected set of previous studies and related literature on the assessment of communication skills. According to Mertler (2001), rubrics are typically the specific form of a scoring instrument used when evaluating student performances or products resulting from a performance task. Kevin et al. (2003) have addressed the assessment of team performance in project-based research experiences of the faculty of the chemical engineering department, as a pilot study. The researchers have
developed four primary areas of importance for assessing and indicated that the areas are very effective in demystifying the evaluation process and they serve to connect the grade in the course to the stated learning objectives better.

To improve the validity and reliability of the assessment results for the course-embedded measures, the measurement criteria and measures should be determined by a team of faculty, not just the instructor for the course (Pringle & Michel 2007). Oral presentations have historically been assessed using standard rubrics such as The Competent Speaker (Morreale & Backlund 2007). Research by Kenneth Wolf & Ellen Stevens (2007) shows that rubrics contribute to student learning and programme improvement in a number of ways. Rubrics make the learning target clear, guide instructional design and delivery, make the assessment process more accurate and fair, and have the potential to advance the learning of students. The alternative is the idea that intelligence can be developed leading to a belief that success can come with learning and the ‘growth’ mindset. McConnell et al. (2008) suggest that the results rely upon many faculties and hence an approved programme-level rubrics should be used with multiple reviewers, which will increase the reliability of the assessment.

In literature, a number of rubrics with specific performance criteria for written or oral communication skills and differing levels of student performance are presented. Rubrics provide a consistent measure for faculty to evaluate a speech that can be directly tied to programme goals (Kerby & Romine 2009). For these reasons, along with promoting faculty involvement, schools are choosing to use their own course embedded, locally developed measures (Smith et al. 2010). Using the rubrics to design the curriculum ensures that courses will provide instruction in key domains, promote assessment that demonstrates development in the target skills and knowledge, and encourage reflection and cognitive self-monitoring in the students.
(Trachtenberg et al. 2010). Thomas W. Zane (2011) has designed to help faculty construct analytic oral/verbal communications scoring rubrics.

The provision of feedback via rubrics can help students identify the specific elements of their work that require improvement. William et al. (2012) have assessed the graduate attributes of problem analysis, design, individual and team work, communication skills, and economics and project management using rubrics. Rubrics have been used in a large range of subject areas, and have been mainly effective in providing student guidance on particular skills and competencies such as insightful writing and group discussion contributions.

2.8.1 Rubrics for Peer Assessment

Rubrics can improve rater reliability. Oakleaf (2009) and Thaler et al. (2009) observe that rubrics are useful where multiple or inexperienced assessors are employed or for peer assessment. This action research project has initiated following observations made during Peer Supported Review (PSR) on the consistency of marking across tutor groups and the performance of students as they progress through the module. Moreover, the rubrics for science writing, consisting of elaborate descriptions of each level of student performance, have proven to be a reliable measure of students’ scientific reasoning skills in written forms.

2.9 COMPETENCY GAP

Almost, engineering graduates need to be trained in soft skills besides applying their future workplace environments with the increasing use of advanced and appropriate technology. Radcliffe (2005) and Patil (2005) proclaim that it is an acknowledged reality as found in the literature that there is a mismatch between engineering graduate students’ skills and those needed
in the workplace. The most of the engineering careers are warranted for a variety of managerial skills and expertise, particularly in leadership and the management projects as reported by Dudman & Wearne (2003). A report on graduate and employability skills published by the Business Council of Australia has warned universities of the graduates declining behind in their ability to meet industrial needs thereby leaving a competency gap, group after group.

2.10 GLOBAL PERSPECTIVE ON EMPLOYABILITY AND SOFT SKILLS

The developed and under developing countries are keen on promoting employability skills through their accreditation councils, professional societies, technical universities and other forums. The councils and organisations are intended to define, identify, facilitate and assess the skill sets. The survey literature of United States, United Kingdom, Australia, Canada, Singapore, Japan, India etc. confer the objectives of employability skills as follows:

2.10.1 Skill Set requisites at the University of Sydney

Australian employers have identified a set of employability skills that they look for when both hiring candidates and promoting employees. The University of Sydney believes that graduates should be more employable, more able to manage with change and more developed as people (Grunwald 1999). In specific terms, graduates should have knowledge skills, thinking skills, personal skills, personal attributes and practical skills.

2.10.2 Anticipations of Canada

Through extensive research, the Government of Canada, along with other national and international agencies, has identified and validated key literacy and essential skills. These skills are used in nearly every job and
throughout daily life in different ways and at varying levels of complexity. According to Lopes (2003), University of Guelph, Canada, some of the most general skills and their anticipations from their employees are as follows:

1. **Self-Understanding**: The ability to know about strengths, weaknesses and individual characteristics.

2. **Time Management**: The ability to administer several tasks at once, to set priorities and allocate time effectively in order to congregate multiple deadlines.

3. **Learning Skills**: The ability to learn effectively and willingly from an extensive range of sources including competencies such as learning what matters, organising information and critical thinking.

4. **Leadership Abilities**: The ability to lead, persuade and motivate others.

5. **Teamwork Capabilities**: The ability to work efficiently as a member of a team and to comprehend the dynamics that make teams successful.

6. **Problem Solving Potentials**: The ability to recognise, prioritise and solve problems. The ability to ask accurate questions, sort out many facets of the problem and determine possible solutions.

7. **Working with Diversity**: The ability to value and endure different points of view, values and philosophies of life and deal constructively with people who differ from you.

8. **Career Planning**: The ability to manage one’s career in a constantly changing world of work.
9.  *Understanding Workplace:* The ability to clutch the underlying values of the workplace, its dynamics and expectation.

10.  *Risk Assessment Management:* The ability to assess alternative courses of action in terms of their consequences and associated risks and to identify alternative ways to reduce inherent risk.

### 2.10.3 The Recommendations of Attributes by the United States

Preparing young people to succeed in education and take up a successful career has never been given higher priority in the United States. For any given profession, there can be several pathways to achievement, but educators, employers and policy makers are constantly looking for alternatives that will help position Americans for success in a competitive world economy. The Accreditation Board for Engineering and Technology (ABET 2004), United States, has three accreditation commissions specifically -Engineering Accreditation Commission (EAC); Technology Accreditation Commission (TAC) and Computing Accreditation Commission (CAC). The set of criteria is related in concept with recommendations on attributes that an engineering graduate must attain:

- a) An ability to apply knowledge of mathematics, science, and engineering; b) An ability to design and conduct experiments, as well as to analyse and interpret data; c) An ability to design a system, component or process to meet desired needs; d) An ability to function in multidisciplinary team; e) An ability to identify, formulate and solve engineering problems; f) An understanding of professional and ethical responsibilities; g) An ability to communicate effectively; h) An understanding of the impact of engineering solutions in a global and societal context; i) A recognition of need and ability to engage in lifelong learning; j) A knowledge of contemporary issues; and k)
An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

### 2.10.4 The Recommendations of Attributes by the United States

Preparing young people to succeed in education and take up a successful career has never been given higher priority in the United States. For any given profession, there can be several pathways to achievement, but educators, employers and policy makers are constantly looking for alternatives that will help position Americans for success in a competitive world economy. The Accreditation Board for Engineering and Technology (ABET 2004), United States, has three accreditation commissions specifically - Engineering Accreditation Commission (EAC); Technology Accreditation Commission (TAC) and Computing Accreditation Commission (CAC). The set of criteria is related in concept with recommendations on attributes that an engineering graduate must attain:

a) An ability to apply knowledge of mathematics, science, and engineering; b) An ability to design and conduct experiments, as well as to analyse and interpret data; c) An ability to design a system, component or process to meet desired needs; d) An ability to function in multidisciplinary team; e) An ability to identify, formulate and solve engineering problems; f) An understanding of professional and ethical responsibilities; g) An ability to communicate effectively; h) An understanding of the impact of engineering solutions in a global and societal context; i) A recognition of need and ability to engage in life-long learning; j) A knowledge of contemporary issues; and k) An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

### 2.10.5 Engineering Councils of United Kingdom

Employability is of strategic importance to the UK. According to
the Engineering Professor’s Council (EPC 2000), the United Kingdom, the
main skills that an engineering graduate should possess are communication
skills, working with others, problem-solving, and improving self-learning
ability and performance. The EPC has also identified the following most
important competencies for engineers:

a. Transform existing systems into conceptual models, renovate conceptual
models into determinable models, employ determinable models to obtain
system specifications, choose optimum specifications and create physical
models, apply the results from physical models to create real target systems,
and review real target systems and personal performance critically.

United Kingdom - Standards for Professional Engineering
Competence (UK-SPEC 2003) from Engineering Council, UK, have
prescribed that an Incorporated Engineer must be able to:

Apply a combination of general and specialist engineering
knowledge and understanding to apply existing and emerging technology; b)
Pertain appropriate theoretical and practical methods to design, develop,
manufacture, construct, commission, operate and maintain engineering
products, processes, systems, and services; c) Provide technical and
commercial management; d) Demonstrate effective interpersonal skills; and
e) Express a personal commitment to professional standards, recognising
obligations to society, the profession and the environment.

2.10.6 Malaysia and Non-Technical Skills

Malaysia is now said to be at the mid-point in its journey towards
Vision 2020 and is transforming to become a developed nation during the
second phase of a fifteen year period. Zubaidah Awang et al. (2006) have
intended in their study to determine the non-technical skills namely,
functional and adaptive skills required by entry-level engineers in the
manufacturing industry. They have classified the required skills into seven categories i.e. four categories of functional skills (communication, creative thinking and problem solving, information management, leadership and organisational skills) and three types of adaptive skills (group effectiveness and teamwork, work-related dispositions and attitudes and personal traits and self-management). The study has found that the non-technical skills are important for entry-level engineers in the manufacturing industry.

2.10.7 Accreditation Criteria in Singapore

More recently, in early 2015, the Singapore government launched the Skills Future initiative, a national movement to emphasise the need for skill relevance and deepening as a way of ensuring high-quality lifelong learning and employment as Singapore continues its transition to an innovation economy. The Institution of Engineers, Singapore (IES, 2004), in its report released in 2004, has defined the following competencies as part of its accreditation criteria of engineering programmes:

a) Apply knowledge of Mathematics, Science and Engineering; b) Design and conduct experiments, analyse, interpret data and synthesise valid conclusions; c) Intend a system, component, or process, and synthesise solutions to achieve desired needs; d) Identify, formulate, and research through relevant literature review, and solve engineering problems reaching substantiated conclusions; e) Employ the techniques, skills, and modern engineering tools necessary for engineering practice with appropriate considerations for public health and safety, cultural, societal, and environmental constraints; f) Communicate effectively; g) Recognise the need for, and have the ability to engage in life-long learning; h) Understand the impact of engineering solutions in a societal context and to be able to respond effectively to the needs for sustainable development; i) Function effectively within multi-disciplinary teams and understand the fundamental precepts of effective project
management; and j) Understand professional, ethical and moral responsibility.

2.10.8 The Generic Skill requirements of Graduates in Australia

The Australian Government has been giving importance to the development of employability skills of engineering graduates resulting in a number of initiatives. A common theme found and expressed in almost all the reports stresses the need for a continuous learning process denoted by a clause namely, ‘lifelong learning and generic skill acquisition by students for economic, cultural and social development’. The premise is that the generic skills, attributes and values will be introduced through curricula. These skills include qualities such as ‘critical thinking, intellectual curiosity, problem-solving, logical and independent thought, effective communication and related skills in identifying, accessing and managing information; personal attributes such as intellectual rigour, creativity and imagination; and values such as ethical practice, integrity and tolerance’.

The Engineers Australia Accreditation Board (2005) has identified similar generic attributes that are as follows:

a) Ability to apply knowledge of basic science and engineering fundamentals;
b) Capability to communicate effectively, not only with engineers but also with the community at large; c) In-depth technical competence in at least one engineering discipline; d) Capacity to undertake problem identification, formulation and solution; e) Facility to utilise a systems approach to design an operational performance; f) Skill to function effectively as an individual and in multi-disciplinary and multi-cultural teams, with the capacity to be a leader or manager as well as an effective team member; social, cultural, global and environmental tasks  g) Understanding of social, cultural, global and environmental responsibilities of the professional engineers and the need for sustainable development; h) Understanding of the principles of sustainable design and development; i) Understanding of professional and
ethical responsibilities and commitment to them; and  j) Expectation of the need to undertake lifelong learning and capacity to do so.

2.10.9 The Competency prerequisites in Japan

The expansion of higher education in recent decades has resulted in an extremely diverse student population. Together with a job market that increasingly expects graduates to be operational immediately after employment, the employability issue is a growing concern of Japan. To develop the skill sets, the Japan Accreditation Board for Engineering Education (JABEE) in its report of 2004 has stressed the following competency set:

a) The ability and intellectual foundation for considering issues from a global and multilateral viewpoint; b) Understanding of the effects and impact of technology on society and nature, and of engineers’ social responsibilities (engineering ethics); c) Knowledge of Mathematics, Natural Sciences and Information Technology, and the ability to apply such knowledge; d) Specialised engineering knowledge in each applicable field, and the ability to apply such knowledge to provide solutions to actual problems; e) Design abilities to organise comprehensive solutions to societal needs by exploiting various disciplines of science, engineering and information; f) Japanese-language communications skills including methodical writing, verbal presentation and debate abilities, as well as basic skills for international communications; g) Ability to carry on learning on an independent and sustainable basis; and h) Capability to implement and organise works systematically under given constraints.
2.10.10 The General Professional Proficiencies of Switzerland

Successful Practices in International Engineering Education (SPINE) Bodmer (2002), Switzerland, is focusing on the analysis of successful practices in engineering education in ten leading European and U.S. Universities. In their final report, Bodmer has recorded the general professional competencies: analysis/methodological skills, basic engineering proficiency, and problem-solving skills. Engineers and Professors have also agreed on the lowest rated proficiencies which include development knowledge and practical engineering experience. Engineers have rated specialised engineering proficiency and research expertise as less important engineering proficiencies. Very important general professional proficiencies include communication skills, English language skills, teamwork abilities, presentation skills, and leadership skills.

2.10.11 Recommendations of Professional Societies

International professional societies like IEEE, ACM etc. involving multinational experts, has an edge over the other national bodies in their recommendations by adding one more facet namely, the curriculum guidelines for engineering education. A few noteworthy examples are provided hereunder.

The United Task Force on Computing Curricula of the IEEE Computer Society (2004) has suggested the following general skills for computer science graduates:

a. Communication b. Teamwork c. Numeracy d. Self-management, and e. Professional development. In 2004, Association for Computing Machinery (ACM), Association for Information Systems (AIS) and Association of Information Technology Professionals (AITP) have published a joint report on ‘Model curriculum and guidelines for undergraduate degree programmes in information systems’ and characterised this discipline as ‘Technology-

2.10.12 Indian Studies on Employability Skills

It is very paradoxical that while ‘availability of highly skilled manpower’ has been identified as the most important factor that is driving the increasing momentum of R & D offshoring/outsourcing industry in India, ‘quality of higher education’ has been identified as one of the main inhibitors as found stated in Value Notes (2004). Arya (2005) shows concern about the lack of positive attitude, behavioral aspects, and ability to cope up with challenges, sincerity, integrity, ethics, self-analysis, discipline, and independent thinking amongst fresh engineering graduates. In India, this task comes under NASSCOM which functions in accordance with the Human Resource Development Ministry. It quotes the following observations from the World Bank Report (2011b) on Science and Technology Manpower:

a) Faculty lacks industry rigour, R & D background and exposure to tools. b) Students lack opportunity and encouragement for creative thinking. c) The flexible and rigid curriculum is not exposed to innovation(industry. d) Teaching is exam oriented without focus on communication and problem-solving skills. e) Continuous evaluation is often not systematised. f) Examinations are often memory based and encourage partial studying through ample choice.

NASSCOM - KPMG (2003) and the Government of India Task Force (2000) (Task Force on Meeting the Human Resource Challenge for IT and IT enabled Services) identify written English, logical reasoning,
problem solving and numerical ability, programming skills, listening/empathy, assertiveness and confidence, integrity, values and discipline, sociability, dependability, and reliability as necessary skills for IT professionals. These reports identify spoken English, foreign language, accent understanding comprehension/creativity, initiative/enthusiasm, team working, multi-tasking and time management, and motivation/drive as desirable skills.

2.11 SUMMARY

The chapter has drawn attention to the importance and need for enhancement of employability of engineering students through soft skills training. The researcher has scoured the research literature and has compiled a collection of relevant studies, which has led to the addition of many questions.

1) How do engineering students enhance employability skills from the perspectives of the 21st-century employers?
2) Do successful engineering students enhance employability through soft skills effectively?
3) What strategies should be adopted to train engineering students in soft skills development?

From the scholarly literature on employability and soft skills, it is clear that engineering students enhance their scope for employability through soft skills training. The literature on mentoring programme and assessment through rubrics has shown that these two are helpful in training engineering students in employability and soft skills. This chapter has reviewed the literature on the research areas in the engineering education.