DISCUSSING EMPLOYABILITY SKILLS IN ENGINEERING HIGHER EDUCATION

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Abstract: *The employability of graduates has become an issue that countries around the world have imposed on their national higher education systems to varying extents. Acquiring effective employability skills becomes increasingly important for both employers and employees in the field of engineering. Employers generally see a graduate's achievements related to the subject discipline as necessary but not sufficient for them to be recruited. Achievements outside the boundaries of the discipline, the so-called soft skills, are generally considered to be relevant in the recruitment of graduates. A certain level of awareness among engineering undergraduates should be addressed regarding lacking or mismatching specific soft skills required in their potential workplace context. Therefore, the purpose of the article is to identify and discuss engineering students' perception on the importance of employability skills such as: communication skills, problem solving and interpersonal skills so that they should overcome problems in getting suitable jobs in the future.*

1. INTRODUCTION

The higher education curriculum must be designed so that graduates should be prepared to face the challenges they would encounter in their future careers and to overcome problems in getting suitable jobs by understanding employability skills and their dimensions. Training work-ready engineering graduates can be achieved by integrating technical knowledge and skills learned at university with employability skills required by industry. In order to perform their knowledge and technical skills effectively, engineering graduates should acquire a set of employability skills such as communication skills, problem solving and interpersonal skills properly.

The purpose of the article is to examine the evidence related to what employers seek when recruiting work force in terms of characteristics, skills, and qualifications, and to discuss a selection of engineering employability skills that have been identified by undergraduate students in the field of Electronics and Information Technology as important and relevant to their future professions.

2. EMPLOYABILITY SKILLS – DISCUSSING THE CONCEPT

Nowadays employers emphasize the need for trained work force with certain fundamental skills that contribute to an effective working environment, which are professionally named employability skills. Engineering employability skills, also known as generic skills, are highly related to non-technical skills. Nevertheless, it has been argued that young people enter the professional world without sufficient employability skills and understanding which are necessary to succeed in the working context.

According to [1] the term skill is defined as:

a. the ability to use one's knowledge effectively and readily in execution or performance.

b. dexterity or coordination especially in the execution of learned physical tasks.

c. a learned power of doing something competently, a developed aptitude or ability.

Technical skills also identified as hard skills are defined according to www. the-definition.com as "job-specific knowledge and techniques needed to proficiently perform tasks that require particular expertise; occupation/job-specific skills" or "job specific tasks directly necessary for successful completion of the job." [2] Furthermore, soft skills / core skills/ key skills refer to people's abilities to communicate with each other and work well together, such as communication, leadership ability, teamworking, motivation, willingness to learn and problem-solving. They vary less from one industry to another, and complement technical or hard skills, which are specific to different branches of engineering. During the recruitment process, the importance employers place on soft skills depends on the nature and requirements of the job. Assessing how soft skills are measured precisely is challenging as it is usually based on employers' perceptions of their interaction with candidates at interview. [3]

Yorke and Knight (2006) explain employability as a set of skills, understandings and personal attributes that make graduates more likely to gain employment and be successful in their chosen occupations with advantages towards themselves, the workforce, and the community. The concept implies something about the capacity of the graduate to function in a job, but, nevertheless, this is not to be confused with the acquisition of a job. "Employability is a multi-faceted characteristic of a person, a set of skills, knowledge and personal attributes that make an individual more likely to secure and be successful in their chosen occupation(s) to the benefit of themselves, the workforce, the community and the economy." [4] Along with

employers' opinions, employability may be defined as 'work readiness' which refer to the possession of the skills, knowledge, attitudes, and commercial understanding that will enable graduates to make productive contributions to organizational objectives soon after commencing employment. [5]

Employability skills are described as a range of competencies or abilities that are necessary for graduates to gain success in the labor market at all employment levels; attributes or transferable skills that support individuals to adapt and progress in their work in order to become employable. They focus more on acquiring skills essential for a job while soft skills focus on personality development and require interpersonal adaptability among different kinds of people, problems, and situations. Employability skills or career management skills imply a display of core characteristics that candidates should possess, such as self-confidence, self-control, inter and intrapersonal skills, honesty, integrity, decision making skills, problem solving skills, reliability, adaptability, flexibility, willingness to learn, time organization, motivation, communication, positive attitude, adaptability, and working with others. [6]

These skills cut horizontally across all industries and vertically across all jobs and depend on the need of the industries of the respective countries bearing different names. For example, in the United Kingdom they are named core skills, key skills or common skills; in Germany- key qualifications; in France- transferable skills; in Australia- key competencies, employability skills, generic skills; in Canada- essential skills, employability skills; in the United States- foundation skills. The Employability Skills for the Future [7] report has identified and described eight employability skills: communication, teamwork, problem solving, initiative and enterprise, planning and organizing, self-management, learning and technology.

However, the nature of employability skills varies from discipline to discipline, and there is "a lack of consensus as to what constitutes employability skills and how they are levelled." [8] Thus, employers' skills requirements may differ by region, sector, and occupation.

Individual employers have their own preferences about the most appropriate recruitment methods for the job in order to enable candidates to demonstrate relevant soft skills to the position in their company which could include tests, asking candidates to provide an example of previous written or project work, taking up references from a previous employer, measuring skills against a set of internally developed competencies, reviewing a student's college portfolio or examining their record of achievement. [9]

Some employers feel that educational institutions focus too strongly on academic skills and qualifications at the expense of employability skills. Employers consider work experience as very important in assessing soft skills because, "many of the employability skills that employers are seeking can only be learned in 'real life' employment situations, even on a temporary basis, such as work placements of two or three weeks." [10] In their study, it is stated that work experience for young people is extremely valuable because young people with

experience of work are better equipped for the world of work than young people without it. Employers may overlook a lack of qualifications if young adults demonstrate positive attributes considering the fact that although young people are perceived as lacking maturity, they are more receptive to learning, they can be trained to perform the job requirements and to fit the organisation's culture and they have the potential to develop their soft skills. [11] [12] Younger people with little or no work experience may be assessed according to their extra curricula activities, such as sporting or volunteering achievements, which employers consider in order to measure employability skills. The definition of 'young people' that most authors agree with refers to people aged up to 25.

[9] report that when employers use formal recruitment methods such as a written CV or an application form, they evaluate the applicant's level of soft skills or employability skills and whether or not to interview them. CVs are used by the employer to infer and assess soft skills. Thus, this formal document in terms of written content, spelling, grammar, presentation unquestionably displays the applicant's motivation in terms of interest in the position or company [13]. From a series of qualitative interviews with employers, [9] highlight the fact that interviews are the most important selection methods in which employers may assess their candidates' suitability and employability for a particular job. Employees are often required to work in teams, so team-working skills are frequently assessed in the recruitment process by asking applicants to provide examples of their experience of working in teams that have been successful or problematic or to explain how they would resolve hypothetical team working situations. Furthermore, employers may use a wide range of recruitment strategies to assess applicants' soft skills from interviews to trial periods considering the field and occupation, the job's duration, its associated benefits, or its nature [13]. While developing technical and hard skills, there is also a need to give importance to soft skills as engineers will have to work in a team, write formal documents, give presentations, negotiate, report to someone else, deal with work pressure etc. Recent employer research has found the growing importance of IT skills to seek job opportunities and also to apply for them.

Communication plays a central part in workplace settings and "many of the tasks people typically perform in their everyday workplace lives are in one way or another related to communication" [14]. Engineers in all positions must communicate the purpose and relevance of their work, both orally and in writing concisely and accurately. When people communicate in their workplace, they always have a clear purpose in terms of what they want to achieve, they need to deal with an audience, peers and supervisors in the company or people outside the company who are going to read the document, attend the oral presentation, visit the website etc. Thus, technical communication creates and maintains the public image of the organisation and also reflects the values, goals, and culture of the organization. According to Koester, workplace discourse "involves interactions occurring across a whole range of occupational settings, from factories to offices, hospitals to government offices, private businesses to non-profit organizations." [15] Workplace discourse is embedded in professional and organizational

contexts; therefore, it implies communication between people displaying different roles and relationships. Some of the main characteristics of workplace discourse are the following: "goal orientation": "an orientation by at least one of the participants to some core goal, task or identity …conventionally associated with the institution"; turn -taking rules or restrictions; "constraints on allowable contributions" implying what it is regarded appropriate to write or say in the workplace setting; professional lexis which may be illustrated by the lexical choice; structure: workplace and professional interactions may be structured in specific ways; the existence of special "inferential frameworks" which includes different ways of interpreting discourse that are particular to the institutional or workplace setting [16]. Workplace interactions are also considered, most of the situations, asymmetrical, as a result of the different amounts of institutional power or expert knowledge distributed among the participants.

Context-specific role-plays should focus the engineering undergraduate's attention on the differing types of communication required with various groups in potential work situations. Oral communication helps them to deliver presentations, explain a process, improve meeting coordination, or develop a project team; whereas, written communication helps them write technical reports, specifications, informational material etc. This type of communication is generally evaluated through the interview process and employers perceive how the candidates express themselves, their vocabulary, and how sociable they are when faced with an interview panel. Listening, the ability to be inquisitive, and the absorption of information are also assessed via this method [13].

Teamwork is another important skill required of graduate engineers because it is "a social strategy built upon knowledge, attitudes, skills, and the ability to combine cognitive appreciation from all team members." [17] Team working skills define the ability to function effectively as an individual and in a group with the capacity to be a leader or manager as well as an effective team member. Team members often get involved in multiple projects in multifunctional, multidisciplinary environments; therefore, they need to cooperate efficiently working as an individual and as a member of a team, to collaborate in order to reach a common goal, to identify the strengths of team members, to show mutual respect.

Considering [7], problem solving skills imply the ability to view problems and challenges pragmatically and to have an analytical approach towards solving problems, to develop creative, innovative solutions and practical solutions, to solve problems in teams, to apply problem solving strategies across a range of areas, to test assumptions taking the context and circumstances into account etc. Self-management refers to having a personal vision and goals, evaluating, and monitoring own performance, having knowledge and confidence in own ideas and vision, articulating own ideas and vision, and taking responsibility. Learning that contributes to ongoing improvement and expansion in employee and company operations and outcomes is describes considering the following features: managing own learning, contributing to the learning community at the workplace, using a range of mediums to learn, for example mentoring, peer support, networking, information technology (IT), courses, applying learning

to dealing with issues about technology and people, having enthusiasm for ongoing learning in order to invest time and effort in the acquisition of new knowledge, skills and technologies, being open to new ideas and techniques. Planning and organising implies managing time and priorities being resourceful, taking initiative and making decisions, establishing clear project goals and deliverables, allocating people and resources to tasks, developing a vision and a proactive plan to accompany it, collecting, analysing, and organising information etc. Technology that contributes to effective execution of tasks means having a range of basic IT skills, applying IT as a management tool and being willing to learn new IT skills. Initiative and enterprise that contribute to innovative outcomes suggests adapting to new situations, developing a strategic, creative, long-term vision, identifying opportunities, and initiating innovative solutions to problem solving.

3. EMPLOYABILITY SKILLS FRAMEWORK CASE STUDY

The activity was conducted to determine the engineering students' perceptions on the level of the employability skills needed in a professional setting. The target group consisted of a number of forty second year engineering students in Applied Electronics and Information Technology from the Faculty of Engineering, North University Centre of Baia Mare, Technical University of Cluj-Napoca. Their task was to rank the eight employability skills included in the activity from the most important one (1) to the least important one (8) according to their own opinions on how important and relevant these skills might be in their future working context.

Tabel 1. Employability Skills Framework -adapted from [7]

Nr. crt.	**Employability skills**	**Ranking**
1.	Communication that contributes to productive and harmonious relations across employees and customers	3.275 (2)
2.	Teamwork that contributes to productive working relationships and outcomes	3.325 (1)
3.	Problem-solving skills that contribute to productive outcomes	3.75 (3)
4.	Self-management skills that contribute to employees' satisfaction and growth	5.25 (6)
5.	Planning and organising that contribute to long- and short-term strategic planning	4.02 (4)
6.	Technology skills that contribute to effective execution of tasks	5.65 (7)

7.	Learning skills that contribute to ongoing improvement and expansion in employee and company operations and outcomes	4.8 (5)
8.	Initiative and enterprise skills that contribute to innovative outcomes	6.525 (8)

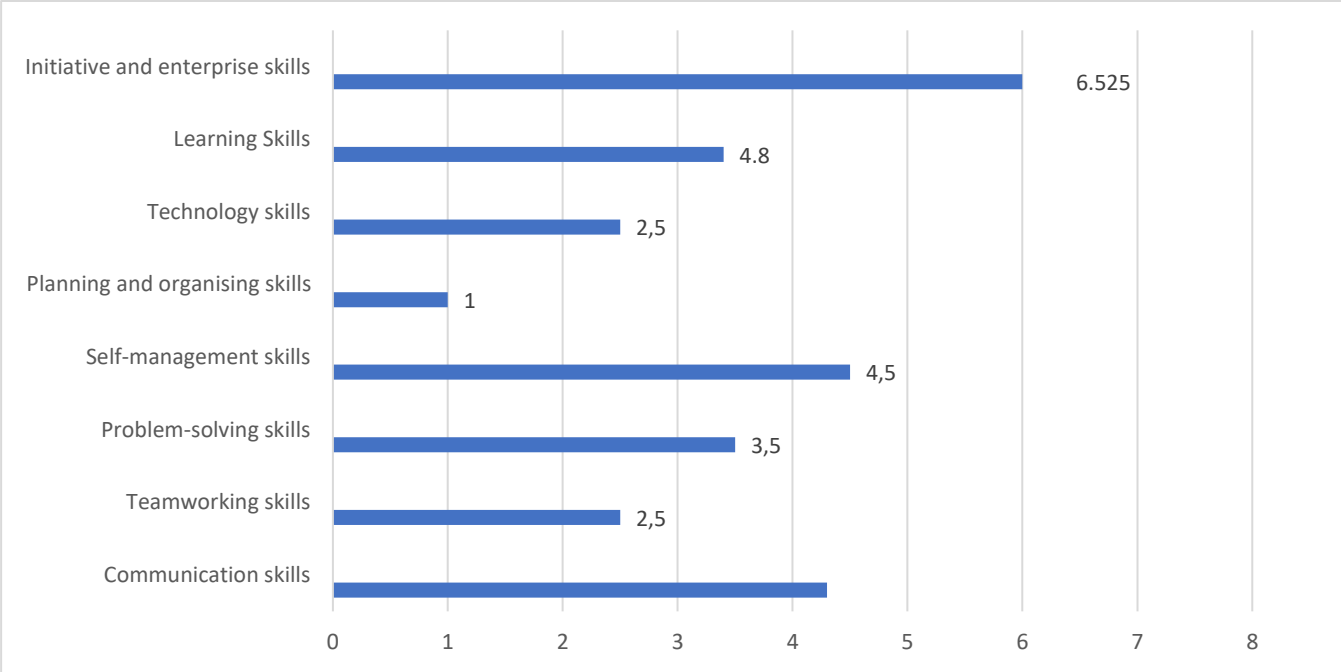

Fig 1. Employability Skills Framework

The three most frequently selected employability skills are teamwork skills, communication skills and problem-solving skills. These skills are essential in order to become competitive and reliable in a professional context, at the same time planning and organising, lifelong learning and self-management skills are considered important too.

4. CONCLUSIONS

Unemployment and the existence of skill gaps among the newly qualified engineering graduates are two challenging issues of the contemporary world that negatively impact all stake holders involved in industry. According to [18], lack of soft skills is associated to younger-generation applicants and employees. Although Millennials and Generation Z who are generally known as digital natives because they have grown up with computers, apps, and the Internet and are able to learn software and systems quickly, they tend not to possess an adequate level of soft skills, such as communication and teamwork. The Role of Career and Technical Education and 21st Century Skills in College and Career Readiness report released by [19]

recommends to education leaders to build infrastructure, programs and relationships that support 21st century readiness. Skills gaps can be closed by providing education which delivers the knowledge and necessary skills for becoming highly competitive, by designing study programs that integrate academic subjects, technical knowledge and 21st century skills. This may be achieved by developing reliable partnerships between educational institutions and businesses or industry organizations; by supporting professional development and learning communities in the field of expertise. [20]

A set of actions should be taken in order to improve employability skills in engineering education by all interested parties: encouraging students to participate in national and international technical competitions that should support them to develop leadership skills, communication skills and teamworking skills; introducing creativity and innovation courses to stimulate future engineers in problem-solving skills; designing industry-initiated courses provided by industry partners jointly with faculty members with a focus on application-based learning that develops critical thinking and promote deep learning; organising compulsory industry internships that would help undergraduates to learn more about the industry work culture etc. As a consequence, given employers' strong focus on employability skills and attributes, any kind of programme, strategy or experience that leads candidates to improve these aspects are likely to contribute to a positive employment outcome.

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