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**ENHANCING EMPLOYABILITY OF GRADUATES IN  
ENGINEERING**

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**Abstract**

The paper presents the results of a study on students' and employers' perceptions of the employability skills of new graduates in engineering. The main objectives of the research are: to explore the perception of Master's students concerning their own skills, knowledge and characteristics which help them to be employable; to explore the students' perception of the targeted job; to identify the employability skills followed by the employers in the recruitment process and in the next period, right after hiring; to assess whether there are differences in the perception regarding the motivating factors at the workplace, between employers and students. In order to explore issues pertinent to the research objectives, interviews with students, young graduates of technical degree programs provided by the University Politehnica of Bucharest, and employers were conducted. Students were asked to specify both subject-specific competences and the transversal competences owned. These data were complemented with the employers' views on graduates' employability. The focus was on exploring their opinions regarding the strengths and weaknesses of graduates/ probationers, during the interview/ or in the next period, right after hiring. The employers' opinion concerning the facilities offered to graduates and young employees revealed the nature of their partnership with the higher education institution, in order to promote employability. The research findings were used for identifying and choosing the best useful tools and developing specific materials that support the work of counseling to career planning for students in the target group.

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**Keywords:** Employability skills; employers' expectations; work environment; assignment; wages; work program.



## 1. Introduction

The employability is a dynamic concept. It has evolved over time, with the focus balancing between the work requirements of employment and the supply-side- individual characteristics. A narrower perspective of the concept was proposed by Fugate, Kinicki & Ashforth (2004), who emphasized the need for employees to acquire various characteristics valued by current and prospective employers: “employability is a form of work specific active adaptability that enables workers to identify and realise career opportunities” (p. 16). They conceived employability as a psycho-social construct consisting of three overlapping dimensions: “career identity” (goals, hopes and fears; personality traits; values, beliefs and norms; interaction styles; and time horizons); “personal adaptability” (the willingness of the individual to develop/ change his/ her attributes in order to meet the demands of the situation); “social and human capital” (social networks, work experience, training and skills development) (p. 20-32). Hillage & Pollard (1998), McQuaid & Lindsay (2005), Baum et al. (2008) (as cited in Green et al., 2013) elaborated broader models of employability, which include contextual factor, such as labour market demand and regulations.

Results from the European Commission report (Humburg, Van der Velden & Verhagen, 2013) show that professional expertise (subject-specific knowledge and expert thinking) and interpersonal skills are the most important skills set that affects graduates’ employability. Work experience is also an essential asset for new recruits (European Commission, 2010; Humburg, Van der Velden & Verhagen, 2013), being even able to compensate for lower grades and a field of study which is not entirely suitable for the job. Employability skills presented in different studies (Brown et al., 2010; Bynner and Parsons, 2002; Krahn et al., 2002; Scarpetta et al., 2012; Simmons, 2009; Worth, 2005) (as cited in Green et al., 2013) comprise hard skills (technical skills), soft skills (non-technical skills) and attributes that contributes to a persons’ employability. Blades et al. (2012) (as cited in Green et al., 2013) define employability skills as those focusing on “personal, social and transferable skills seen as relevant to all jobs, as opposed to job-specific technical skills or qualifications” (p. 30).

“Employers’ perception of graduate employability” (European Commission, 2010) shows the perception of graduates recruiters regarding the importance of various skills/ capabilities when recruiting higher education graduates, the level of employers’ satisfaction with these skills, the factors that influence the level of graduate recruitment and the major challenges that companies face in hiring graduates.

The report “STEM Graduates in Non-STEM Jobs” (Mellors-Bourne, R., Connor, H & Jackson, C., 2011) presents the factors that have a significant impact on STEM (science, technology, engineering and mathematics) graduates who choose to pursue a STEM career, e.g. “have a definite career in mind at entry to university”; “undertake degree-related work experience”; “not change career plans during university”. (p. 39).

## 2. Methodology

The investigation was part of a broader research on the employability of graduates in engineering, conducted in October- December 2015, within the SCOP project- “Increasing the students' performance through practice and guidance”, co-financed by the European Union under the European Social Fund. The research results were used for the development and provision of guidance and counseling for 250 students

in master programs in technical fields, in order to increase employment and adaptability to support their first job.

The paper presents various aspects regarding the individual characteristics required for a job, and the working context (interpersonal relationships, physical working conditions and features of the workplace), from the perspectives of students, graduates and employers: students' perception on their own employability skills; graduates and employers' views on the personal attributes valued by employers in the recruiting process and in the next period after hiring; students' perception on the targeted job (working conditions, the employment/ professional status, wages, the working program etc.) and their expectations from employers; employers' views on the facilities offered, in the companies they represent, to master' students and young graduates.

For the investigation we used both, qualitative methods (focus group and individual interviews conducted with students, graduates and employers) and quantitative methods (analysis of the study programs documents). The sample was selected using convenience sampling. It comprises: thirty five master' students attending the study programs organised by the Faculty of Engineering and Management of Technological Systems, University Politehnica of Bucharest, four graduates and six employers - representatives from companies of production/ distribution of metal fabrications/ equipment. Students and graduates were invited to participate in the project as members of the target group, and included in the sample on the basis of their options. Participating companies were selected considering the field of the business activity.

### **3. Results**

#### **3.1. Competences Owned by Master's Students**

Most students expressed their opinions regarding the competences owned for performing the targeted job in terms of knowledge, skills and personality traits. The most frequent responses regarding knowledge in the field of study are: theoretical training on CNL programming; knowledge in mechanics and strength of materials; knowledge of 3D modeling; knowledge in designing industrial robots, industrial sensors; theoretical training in CATIA, Inventor; knowledge on legal issues, knowledge on fundamentals of quality management in occupational safety. Among the skills, most frequent were mentioned: skills for using measurement tools and specialized programs, skills in mechanical and organizational design, skills on Computer Aided Design, skills on SCKERS, GSD, ASAHBLY, 3D PART, skills of 3D modeling, algorithmic thinking, creativity and innovation skills, problem solving skills, planning and organization skills. The level of the knowledge acquisition and skills development vary from basic, acceptable, to good or quite extensive (e. g. "basic training acquired in university; practical training acquired only in university"; "a quite extensive theoretical training; good knowledge and practical training"; "better theoretical than practical training"). Initiative, resilience, diplomacy, attention to details, adaptability, patience, obedience were specified as personality traits by most students.

Regarding subject-related competences most frequent responses refer to: competences in the design and control of welding processes; competences in the design of the welding equipment; competences regarding the integration of SSM in work processes; understanding and use of standards series 9000, 18000, 14000; competences regarding SMC design; CAD- CAM design; competences on

ISO 24 444 / ISO 24 443, ISO 24442, specific quality standard procedures; competences on CATIA, Inventor, industrial robots, sensors; competences on SolidWorks, MATLAB Inventor, hydraulic actuator; competences in the use of methods of quality inspection; fundamentals of quality management and safety.

### 3.2. Students' Perception of the Targeted Job

Most of the respondents mentioned that **the tasks to be performed** are those specified in the job description, and the workload is adequate. Responses highlight the following features of the assignments: they are clearly formulated; are ranging from simple to difficult; require collaborative work; the complexity of assignments depends on the employee's competences. Two respondents described the working tasks as challenging. They have made remarks of the usefulness of working tasks for their professional development.

**The work atmosphere** was described as pleasant, collegial, motivating and dynamic, providing employees with opportunities for career advancement. Students' perceptions on the job comprise also aspects regarding good relationships with colleagues and superiors, access to information, effective collaboration with colleagues; receiving feedback from managers, and having their work appreciated by superiors.

Most of the respondents presented **the work program** as normal – eight work hours per day. One student stated that the work program is not so important since employees work in decent conditions and are motivated. Some respondents specified that a flexible work program is expected, especially during the study period.

**Relationships with colleagues and superiors** are described as good or satisfactory, even difficult sometimes. Communication and collaboration are considered very important by most respondents.

### 3.3. Students' Expectations from the Employer

Some respondents are expecting decent **working conditions**, a safety working environment, while others good or very good working conditions: "working conditions according to the job necessities"; "working conditions under EU regulations", "good quality of the technical equipment"; "modernization and adaptation to new generations of equipment"; "providing employees with opportunities for career development", "providing employees with opportunities for learning new things" etc.. Other respondents suggest they would appreciate the flexibility of the working schedule and a positive attitude of employers.

The respondents did not mentioned specific jobs/ functions on the labor market. Most of them specified that the **professional status** should correspond with the job/ function and the employee's work experience.

For most students, **the salary** should be incentive, according to knowledge and working performance, and confidential. In terms of wage levels, the responses vary: "It's all about wages: a good payment leads to effective work, with good results"; "Wages should ensure a decent living"; "Wage bonuses are necessary"; "Payment should be above average". Deloitte study (2016) describes the Y generation as one with traditional values and expectations. A good work/ life balance is also important for them. Customer care focus and the positive impact of business on society are also important motivators for majority of Millennials.

### **3.4. Facilities for Graduates/ Young Employees. The Employer's Perspective**

The **work experience** is usually used as a requirement tool by employers. In this respect, most respondents have mentioned that they offer work placements, internships and work trials in the organization they represent. One employer even mentioned that graduates may start the professional activity without an extensive prior working experience.

The following characteristics of the **work environment** are considered important motivational factors of young employees: dynamic, friendly, youthful and incentive. Regarding the employer's perspective of the **employee's professional development**, all respondents expressed their willingness to provide young employees with support for skills development, through daily activities or training (e.g. "The possibility to quickly learn and implement all the technological flow operations"; "Support to gain technical knowledge"; "A training period regarding the marketed equipment").

### **3.5. Qualities Employers Look for in Candidates During the Interview**

Human capital is critical to the ability of any organisation to maximize its potential. Employing the right persons is therefore a critical component of business success. The attributes the respondents look for in candidates when recruiting new staff are: basic professional knowledge/ specific technical knowledge, capacity for applying knowledge in practice, interest in the domain of the business activity, capacity and willingness to learn, concern for quality and will to succeed.

Considering their experience in the job interview, graduates have mentioned the following attributes: basic professional knowledge, willingness to experience new things/ activities, computer skills and interpersonal skills.

### **3.6. Employers' Expectations Towards New Employees**

Among the probationers' strengths, employers mentioned self-confidence, ambition (interest in career development), seriousness, spontaneity, good knowledge of PC, technical knowledge. For them it is important to see a good evolution of the employee in the next period after hiring. The work behaviours most appreciated are: involvement in projects; finding new workflows. At the opposite, reduced working speed, low productivity and lack of interest are highlighted as weaknesses of the new staff. In their opinions, sometimes the employee's requests are a little higher than the attributes they possess. Employers' expectations towards new employees are: a decent behaviour at the workplace, sociability, reliability, ability to work in teams, technical knowledge and interest in specific industry.

## **4. Discussions**

Almost all skills considered important by employers in the recruiting process were mentioned by master students among their personal attributes. Comparing their views, we appreciate that differences may arise regarding the practical training of graduates.

Neither competences profiles presented by master students, nor the skills mentioned by employers comprise understanding of cultures of other countries, knowledge of a second language, ability to work in an interdisciplinary team or ability to work in an international context. According to the Eurobarometer

survey on “Employers’ perception of graduate employability” (2010), foreign language skills are more important in the private than in the public sector, and especially to recruiters with international contacts (European Commission, 2010). In certain organizations few people with excellent skills of this kind are sufficient.

In the literature on high performance working (Humburg, Van der Velden & Verhagen, 2013), facilities provided to graduates and young employees to enhance employability- a competitive and incentive working environment, the opportunity to make effective use of their skills and develop them- are considered beneficial for employers. According to the research results, the exploitation by the organisation of the skills employees currently have to offer, and providing employees with opportunities for learning new things in a dynamic, competitive and incentive work environment were the aspects most frequently mentioned by students when describing their expectations from employers.

## 5. Conclusions

Students’ skills and preferences are very important in determining the mix of vocational provision, but reflection on labour market requirements should be also considered (OECD, 2010). Career guidance services in the university should provide students with clear information about the study programs, in order to help them to choose those that provide the type of competences which are most needed in the labor market. On the other hand, by informing students about the areas of skills shortage and the labour market returns (e. g. wage returns), career counselors can support students, most interested in the financial aspects, for example, to prepare for well-remunerated jobs.

Strengthening the collaboration between the university and industries may allow students to make informed choices about training programs and targeted jobs, and provide employers with correct information about the learning outcomes of the graduates.

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