

DETERMINING THE SKILLS NECESSARY FOR ROMANIAN GRADUATES OF ENGINEERING AND MANAGEMENT IN ELECTRIC, ELECTRONIC AND ENERGETIC FIELD

IZVERCIANU, M[onica]; POPA, H[oria] L[iviu] & DRAGHICI, A[nca]

Abstract: This paper aims to establish the skills necessary in the labour market that graduates from engineering and management in electrical, electronic and energetic field (named *Engineering and Management*, from now on) must master. The objectives derived from the above-mentioned aim are: interviewing management and engineering graduates from several Romanian universities, interviewing skill developers (technical-economic universities) and potential employers of the graduates.

Keywords: competences, Human Resources, graduates, Engineering, Management

1. INTRODUCTION

In order to determine the skills that graduates must develop one must take into account the graduates' professional development, which presupposes the existence of a genuine "engineering of their professional formation" through skill development, which, in its turn, implies innovation, planning, achievement and assessment. We suggest that the engineering of skill formation be built at the level of two axes: an axis representing the individual and the organization, and another representing education and production (Fig. 1).

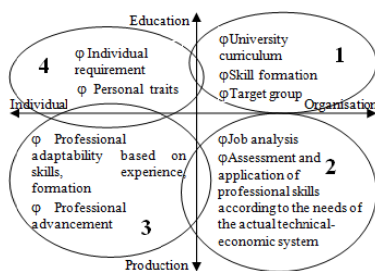


Fig. 1. The engineering of skill formation

Note that, in order to pass from the sphere of the university curriculum (1) into the professional sphere (2), one must make a practical move and begin by studying the activities related to the job, then analyze the skills necessary and, finally, obtain a real formation referential (3) that allows for the acquirement of the new skills necessary in order to achieve professional advancement, all in accordance with individual requirements and personal traits (4).

2. RESEARCH METHODOLOGY

The analysis used in determining the skills was structured according to the flow chart suggested by the authors (Fig. 2). The flow chart starts by deducing professional skills from the human resource policies of the enterprise and the

university skill formation policy, which are anchored in the economic, social, cultural and legislative environment.

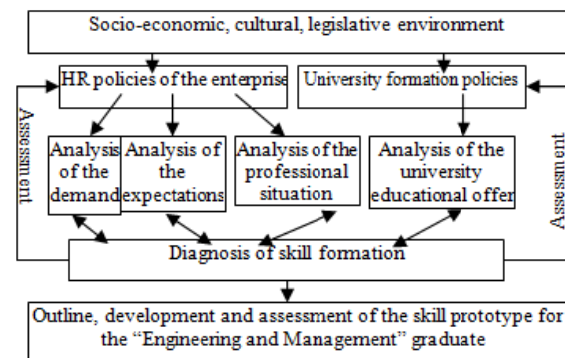


Fig.2. General Framework for Determining the Skills (Izvercianu, 2002)

We chose to employ a qualitative research method, namely the phenomenological group analysis, while the techniques used were the "centered non-direct group interview" parallel with the questionnaire technique. (Codecs, 2010)

Three target groups (A, B, C) were analyzed, according to the objectives pursued.

>Group A

-Work sample: 31 potential employers, companies that operate in several fields: electrical (13), electronic (11) and energetic areas (7).

-Research method: phenomenological group analysis.

The technique used was the "centred non-direct group interview", in which a group interview is organized. Each respondent participates willingly in the interview and is faced with a real or imaginary situation, then encouraged to express their opinions on the given situation. The most common comments are registered.

-Research topic: the needs of the enterprise in HR policies (qualifications, jobs) and the expectations of the enterprises as concerns "the *Engineering and Management* graduate's skills"

>Group B

-Work sample: 10 universities, developers of engineering and management skills and 23 university curricula.

-Research method: analysis of the curricula in a group consisting of six specialists.

-Research topic: skill formation in the educational offers supplied by universities in their curricula, for the field of "Engineering and Management".

>Group C

-Work sample: 80 university graduates in the field of "Engineering and Management", Bologna cycle, coming from several Romanian universities.

-Research method: the "questionnaire" technique comprising a quantitative synthesis of the respondents' answers, which subsequently formed the basis of a qualitative analysis within the "phenomenological group analysis".

Research topic: the needs of recent university graduates, who master the skills acquired during their university studies and who are struggling to obtain their first job. The results gained through the data processing and interpretations have led to the proposal of competences for the Engineering and Management graduates, which guide us to some types of qualifications, matching the international ones from the Engineering and Management area, i.e. USA, France, Germany, and Austria. (Mitrani et al., 1992)

3. THE MAIN COMPETENCIES PACKAGE PROPOSED FOR THE “ENGINEERING AND MANAGEMENT” GRADUATE

Main Competency Areas

I) Fundamental knowledge - engineering science and basic principles

C₁-Applying theoretical and practical knowledge of science, mathematics, as well as basic engineering principles, when performing calculations, making demonstrations and developing practical applications in order to solve engineering and management problems.

C_{1.1}-Sound knowledge of the basic mathematical principles and fundamental scientific concepts and procedures used in order to design and build systems, structures, processes and products.

C_{1.2}-Sound knowledge of the basic engineering concepts and procedures used in order to design and build systems, structures, processes and products.

C_{1.3}-Understanding the properties, applications and limitations of the instruments and materials employed when designing and building systems, structures, processes or products, and solving errors related to the correct usage of resources and instruments.

C_{1.4} - The ability to use modelling techniques in order to solve problems specific to the field.

C_{1.5}-Basic understanding of the concept framework and of the part that different study disciplines play in the field, in order to assess the work involving complex systems from a multidisciplinary approach.

C_{1.6}-Laboratory work proficiency

II) Knowledge and technical abilities acquired through specific engineering study disciplines

C₂-Knowledge and application of the concepts, principles and techniques related to specific economic-engineering study disciplines necessary for the expertise in and the design of engineering issues through the efficient use of computers.

C_{2.1} - Knowledge of the instruments and materials specific to the area of the engineering disciplines in question, necessary in order to interpret and explain situations, events, processes, and projects related to the field.

C_{2.2}-Keeping up-to-date with topics in the area of the specific engineering disciplines in order to solve problems/ situations that can be encountered when providing qualified assistance.

C_{2.3}-Using assessment criteria and standard methods properly, in order to evaluate the quality, merits and limitations of processes, programs, structures, systems and products.

C_{2.4}-Having advanced knowledge of a least one module in the area of engineering disciplines, as well as the expertise necessary in order to make corrections to calculations, projects and other components specific to the disciplines.

III) Entrepreneurial Knowledge and Abilities

C₃-Knowledge relating to the planning, programming and self management of enterprises with emphasis on SMEs and the associated logistics networks: *planning, programming, management and production tracking*.

C_{3.1}-Using basic knowledge in the planning, programming and the management of production in order to explain and interpret the processes and projects related to the field of Engineering and Management.

C_{3.2}-Applying basic methods and principles for planning, programming and self-management of SMEs when providing qualified assistance.

C_{3.3}-Using standard assessment criteria and methods properly in order to evaluate the quality, the limitations and the benefits of certain methods for planning, programming and self-management of small and medium enterprises and the associated logistics networks.

C_{3.4}-Planning of professional projects in terms of scheduling, programming and self-management of small and medium enterprises and associated logistics networks, while using the principles and methods recognized in the field.

IV) Design and Problem-Solving

C₄ - Knowledge and abilities necessary in order to creatively and systematically solve complex problems in the field of Engineering and Management, using sustainable solutions.

C_{4.1} - The ability to assume investigations on complex problems, to formulate these problems and to solve them at system, structure, process or product level.

C_{4.2} - The ability to develop creative design ideas based on creative assessments and existing practices.

C_{4.3} - Knowledge related to the systemic approach to engineering and management activities based on the cost and time considerations that affect the design.

V) Communication and Continuous Development

C₅-The skills necessary in order to be able to communicate in different professional and social environments and make proper use of the resources related to continuous development.

C_{5.1} - The ability to compile correct documents, in accordance with specific procedures.

C_{5.2} - The ability to discuss and negotiate effectively and productively.

C_{5.3}-Using all the resources and learning techniques properly in order to aim for lifelong personal and professional development, as well as objective self-assessment in order to be integrated into the labour market in a timely manner. (Proiect DOCIS, 2009)

4. CONCLUSIONS

The present paper represents a continuation of the research developed in the framework of Leonardo da Vinci Program - "Entrepreneurship & Sustainable Development" Project (Forrest Project, 2007), augmented with the new premises of current research, during which were studied the Universities offers for the "Engineering and Management" field, the enterprises needs in their Human Resources policy, as well as their expectations regarding "the competences of Engineers in the Engineering and Management field.

In the paper were established, as a consequence of the results obtained from the research, the professional competencies of "Engineering and Management" field graduates.

The originality (novelty) of paper is the establishment of professional competences at higher education level ("Engineering and Management") and that is the first complex investigation in which worked together the competences providers-universities, competences beneficiaries-graduates and the employer enterprises.

5. REFERENCES

- Codecs, (2010) *Management Performant, relatiile cu grupurile interesate*
- Forrest Project, Leonardo da Vinci Program (2007)
- Izvercianu M, (2002), *Marketingul Resurselor Umane*, Ed. Solness, Timisoara
- Mitrani A, Murray D.M., Bernard A., (1992) *Des competences et des hommes, le management des ressources humaine en Europe*, Les Editions D'Organisation, Paris
- Proiect DOCIS, (2009)