



THE EDUCATION IN ENGINEERING FIELDS IN FRONT OF MARKET DEMANDS

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Abstract:

Impacts of globalization on the engineering profession create a challenge in understanding what it means to be an engineer in the global economy of the 21st century and how should be prepared the future engineers. Engineering education today faced with request for preparation of the engineers with the necessary skills to cope with and benefit from the great changes that globalization brings. In this context, to understand how and how well we need to prepare the future engineers should be known the new capabilities that businesses and industry require from engineers. Fulfilment of all the requirements of a global economy and coping of challenges from the Institutions of Engineering Education directly requires the integration of competency based on new technology in curricula of programs they offer. So in this context, this paper it aims to identify the IT skills required by the market and to identify the quality of delivery of those skills from the Institutions of engineering education. To achieve this purpose were conducted interviews with directors/ managers of companies and teacher from institutions of engineering education. Outcomes of this research show that there is somehow a line between what is on offer in Institutions of Engineering Education and market demand for graduates in these institutions. But it remains that engineering education must increase performance of students in IT.

Keywords: engineering education, market demands, IT, programming languages, design, modelling, data basses

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1. Introduction

The level of economic and social development of a country depends from the quality of education system in that country. The rapid economic development and the global changes that are happening today, based on high technological development, pose many requests for education system in engineering fields. This is because the development of the modern world is dominated by engineering and technology and the role of the engineering education is linked closely to the needs of society and economic development. The engineering education in a focus of globalized economy is seen as a main key for solving many problems based on community. Therefore, referring to all this, engineering education in the last decade is undergoing continuous reform with aim to improve the teaching and learning even the container that is provided in order to meet the requirements of the market. Information Technology is a very important factor, which helps in increasing business success.

2. Literature Review

Information technology is the only technology which provides the ability to analyse specific data and to plan the further development of business accordingly. It also provides many tools that can solve complex problems and to plan business expansion in the future (Duncombe, 2015). The role of IT in business is widespread in many areas, ranging from Communication, Data Management, Management Information Systems, Customer Relationship Management, etc. (Prasanna, 2014). Referring to the demand for IT skills, for the students of engineering is progressively big (IET, 2015). So it should be a fit between the demands of the market and the preparation of students from the institutions of engineering education. A non-adaption of the skills with market requirements has a significant economic cost and social (Klosters, 2014). To see how is the situation in this context, in this paper will appear demands of companies for IT skills addressing to the graduates for engineering and thoughts of teachers regarding how they equipping their students with these skills.

3. Materials and Methods

To fulfil this research there have been used qualitative method. Also there has been reviewed a relevant literature to conduct this study and interviews were conducted with focus groups from the ranks of teachers and directors / manager of companies. Focus group of teachers comprise from six teachers from the following universities:

University of Prishtina "Hasan Prishtina" / Faculty of Electrical and Computer Engineering, University of Southeastern Europe / Department: Contemporary Sciences and Technologies / Macedonia, Sacred Heart University / Department of Computer Science / Fairfield US and Technical University of Vienna (TU Wien) / Faculty of Electrical engineering and Information Technology. While focus group of companies consists of 5 directors / managers of companies like SIEMENS in Austria, BOSCH ,Germany, Telecom of Kosovo (TK), Kosovo Energy Corporation (KEC) and DataProgNet, Kosovo. For respecting ethical principles, respondents were presented with identification codes representing the institution's name from comes the interviewee. The opinions of respondents for each question will be presented in tabular form.

4. Results and Discussion

First, the interviewed from both groups are requested linked with that haw they are satisfied with the quality of education in the engineering field

The respondents code	Answer
UPFECE	Quality of studying is in a average. It has great space to improve the quality and to improve the study curriculum.
TUW	This university offers high quality studying.
SHU	It is a level that responds to the immediate needs of the labour market.
SEEU	I think that the University has built stable instruments to measure the quality of learning and teaching, with a focus on knowledge, skills and competencies engineering. According to data from the assessment of students, the system of classroom observation and data employability of computer engineering students can be derived conclusion that the quality of education is comparable with international standards.

Table 1: The opinions of teachers in the question: Which is your opinion about the quality of engineering education that offers your university?

The opinions of the representatives of the companies dealing with this issues are presented in the following table.

The respondents code	Answer
DataProgNet	Good.
TK	The quality of education that offers Faculties of Engineering (University of Pristina, "Hasan Prishtina") is satisfactory for the labour market in Kosovo.
BOSCH	Quality is good.
KEC	Education in technical sciences in general is improving, and efforts are being made by educational institutions to adapt to the needs of the labour market.
SIEMENS	Is satisfactory

Table 2: Opinions of the managers of the companies in the question: which is your opinion for the quality of engineering education that offers the engineering universities?

If we compare the opinions of teachers respondents from the universities abroad and managers of foreign companies we see that they are in the same line of thoughts about the quality of engineering education. Also the opinion of teacher from FECE, is almost in line with the opinion of Managers of local companies, where expectations of both parties for the quality of engineering education are not at the level they would like.

Based on the answers in taken by managers of companies on the question of the above, it was made a question for them, which had to do with whether graduates for engineering, respectively graduated students for Computer Engineering and Telecommunication are prepared for the labour market. Their opinions are presented in Table 3.

The respondents code	Answer
DataProgNet	Prepare of the students in this two profiles for the labor market is in the average level.
TK	In the considerable number are almost prepared for the labor market.
BOSCH	Students from the German universities are more prepared conform the requests of the labour market.
KEC	Students of Computer engineering, differently from students of the other engineering directions, have more possibilities for application of knowledge gained in practice, In a slightly more advanced computers, now it is the opportunity to simulate complex systems of IT. However, the application of these opportunities and advantages that enables this technology is not being

	made appropriately. Perhaps, due to the orientation of our universities to give priority of scientific aspects before them practical. So that, such thing did to them not to be so much prepared for the labour market.
SIEMENS	Students of these directions expect challenges in the labour market. Requirements that are addressed for them are very large in terms of practice, so in this context it can be said that depending on the region / country from where the graduates came from there are differences in the level of their performance.

Table 3: Opinions of managers of companies in the question: Are prepared according to you the graduated students for computer engineering and telecommunication for the labour market?

From the answers in respondents, we can see a difference in their opinions regarding the fulfilment or non-fulfilment the requirements of the market by the students of these two directions. This difference is not only between domestic companies and foreign companies, but also between of local companies. KEC, in this context, is not very satisfied with the level of preparation of graduates in these two directions, to meet the requirements that this corporation has. According to the opinion of the manager of this company, this thing is in this way because that the orientation of the university is more in scientifically aspect than in practical aspect. Being driven by this answer, respondent teachers have been made two questions: under 1, is it the curricula of engineering programs in your university according to the requirements of the time, when is taken of view of the fact that we are in a time of global competition? And under 2, students in their universities are preparing more for scientific or market requirements? Their answers are presented in the following two tables.

The respondents code	Answer
UPFECE	Yes, we continually advance and modify the curricula conform the request of the time.
TUW	Yes.
SHU	Yes
SEEU	Yes

Table 4: Opinions of the teachers in the question: Do you think that the curricula of engineering programs in your university are conforming to the requests of the time, when you know that we are in a time of global competition?

The respondents code	Answer
UPFECE	It depends on the level of study, but all studies programs are scientific!
TUW	Even for the labour market also for scientific work
SHU	The demand of the labour market is specific for this University.
SEEU	I think that our students are prepared in a balanced way as for the requirements of the labour market as well as for scientific side.

Table 5: Opinions of the teachers in the question: Do you think that students in your University are preparing more for requirements of the labour market, or for scientific side?

By thoughts of the teachers presented in two tables above, we notice that institutions of engineering education are offering programs with curriculum based on the requirements of the time, and that these programs prepare students for the labour market and for the scientific excluding SHU, which prepares students for the demands of the market only. The response of the manager of the KEC, for the fact that the students are more prepared for scientific side than for practical side, has basis in the answer provided by the teacher of FECE, since the latter thinks that programs in FECE are scientific.

So here, we can address the problem associated with the non-fulfilment of the total requests of the companies by graduates in engineering. Whereas, in this context respondents from universities and foreign companies think that the graduates in universities in their country meet the requirements of the labour market. Regarding the requirements for versatility in one particular field of engineering that companies have, were stressed those for good skills in IT. So to see what are the requirements of companies in the IT field we have made a question them: According to you, what should know a student from engineering fields in the field of information technology to meet your requirements? Their answers are presented in the following table:

The respondents code	Answer
DataProgNet	Ability to design and programming in engineering complex software systems.
TK	To have proper preparation for work in IT, programming languages, DB technologies, sufficient knowledge about computer networks and other technologies of telecommunication systems
BOSCH	Ability to design different hardware components.
KEC	Special knowledge and deeper in Infrastructure of Service Systems (SAN storage, servers, virtualization, etc.), in computer networks, designing,

	configuring and maintaining Cisco equipment
SIEMENS	To have excellent knowledge to manipulate the different programming languages, and knowledge in the field of signal processing and design of various components.

Table 6: Opinions of managers of companies in the question: According to you, what should know a student from engineering fields in the field of information technology to meet your requirements?

From the table above we see that requests of the companies for the knowledge in the field of IT, from the graduated for the engineering are different, depend from the context of their scope. However, as a joint request of all companies was the knowledge of the programming language and the art of programming, designing and the work with databases. While, the requests of the companies in a specific way was also for the computer networks, designing of systems and other different components. That what makes to be different the foreign companies with local, when we are to the requests is the fact that foreign companies requests that first of all the graduated for engineering first most love the job and to have the creativity to realize the ideas and his knowledge from such a fields.

If we refer to the requirements of companies, and if we analyse the answers that teachers have given in the question: According to you, what should know a student from engineering fields in the field of information technology? (see table 7), we note that the design, communication networks, programming, software and digital circuits are the most important components for an engineer.

The respondents code	Answer
UPFECE	Management of information, processing of data, databases, communication network (computer networks is only a sub-community), data security, artificial intelligence and Internet technology, to count some.
TUW	Competences which would be acquiring by students are broad and are specific to each respective direction for example for computer engineering are, programming of operating systems, digital design, distribution systems dependent on real-time, digital circuits, programming languages, design, development management and distribution systems and networks, etc.
SHU	Computer engineering here should be distinguished from non-computer. Speaking of non-computer engineering, engineer must have some basic knowledge about data bases, to know a programming language and to become acquainted with software that meets the needs of an engineer as

	MATLAB. While computer engineering requires a high level of knowledge in Information Technology.
SEEU	Engineering students must possess the necessary of the basic knowledge in the courses from areas: circuits, systems, computer engineering and computer science, as well as knowledge of elective courses - depending on the interests of students, such as computer systems; nets; engineering applications; software and programming languages; or algorithms and mathematics ...

Table 7: Opinions of the teachers in the question: According to you, what should know a student from engineering fields in the field of information technology?

So if we analyse both opinions we see that teachers see as key components to engineer, precisely those components that are required by companies. Such a conception has given a positive result in preparing students for the labour market in the context of a globalized economy. This can be seen from the thoughts that have given respondents from companies in question: Do you think that engineering students, your potential workers in the future are prepared according to the requirements of the time, when taken in view of the fact that we are in a time of a globally competitive economy? Where answers were unanimous in that students are prepared according to the requirements of a globally competitive economy. To see what is the role of IT in success of business development of these companies, respondents answered the question: According to you which is the role of Information Technology on the success or failure of your company? Their opinions are presented in Table No. 8.

The respondents code	Answer
DataProgNet	The role of information technology in the success of our company is great, because the services that offer our company belong to this field.
TK	Today everything works based on Information Technology. Therefore, the success of any company depends on the developments and investments in this field.
BOSCH	Large but not decisive. Our company first produce the components of Hardware. Information Technology contribute acutely only as a conductor produce. (Nice to have!)
KEC	Division of Information Technology is very important for business development in our company. Every business unit in our company, collaborate closely with this division to enable better fulfil job duties.
SIEMENS	Of course that is very large, almost all our activity is based on TI

Table 8: Opinions of managers of companies in the question: Which is the role of information technology in the success or non-success of your company?

As seen from the table, they think that nowadays everything is based on the IT, and that the success of companies depends largely on investments made by the company in this field in human capital.

5. Recommendations

Today almost all companies support their work in one way or another in the use of IT, and success or failure of their activity depends on investments and developments in IT. Information Technology is the enabler of innovation process, no innovation without IT (Davenport, 2013). So in this context it can be said that the key to innovation found in the skills of engineers in the field of IT. Engineering education must therefore to strengthen this component as one of the main demands of the labour market.

6. Conclusion

Market demand is factors that significantly affect the preparation of curricula of study programs of higher education institutions. This somehow preceded expected skills and achieved from graduated students within these study programs. The major benefits of the use of IT within companies and businesses, no matter if they big or small, It increases demand for exploitative and innovative capability within this field. Students of engineering, respectively computer engineering and the Telecommunications, in order to be open to market demands, they need to develop their skills for innovation in programming, modulation, design and signal processing. The local companies are average satisfied with the performance of engineers from FECE, while foreign companies make ranking of the performance of engineers depending from institutions they came from. So in this context, the engineering students to be part of the market economy globally competitive They must have ability in designing and programming in complex engineering software systems, design and modulation of databases, design and maintenance of computer networks, knowledge for infrastructure of Server systems, etc.

About the Author

Kyvete Shatri has finished primary and master studies in the University of Pristina - Faculty of Electrical and Computer Engineering, Section of Computers and Telecommunication. Actuality she is finishing her PhD studies in the fiend of ICT, exactly in the influence of ICT in improves of process of teaching and learning. Her

experience in teaching is 10 years, in the secondary school and actually she is assistant for the group of subjects from Information and Communication Technology in Faculty of Education at the University of Pristina. The field of research that she is interested is the improvement of teaching and learning of students throw using ICT. She has some research (Have a look in the list done) and a Book “The possibilities of interconnection of local networks LAN to the Internet” 2011, USA.

Publications

1. Visual teaching and learning in the fields of engineering, publishing in the journal Academic Journal of Business, Administration, Law and Social Sciences, November 2015, Tirana
2. The using of ICT in teaching in lower secondary school in Kosovo, SGEM International Multidisciplinary Conferences in Social Science and Arts, Albena Bulgaria, September 2014
3. Using Educational Technologies to enhance learning of students at Faculty of Electrical and Computer Engineering at University of Pristina, SGEM International Multidisciplinary Conferences in Social Science and Arts, Albena Bulgaria, September 2015
4. Information Technology in function to increase the quality of teaching. Case study, the use of simulator at the Faculty of Electrical and Computer Engineering at the University of Pristina, Albanian studies days Conference, Tirana, Albania, 2013

References

1. Duncombe, R. A. (2015). Mobile Phones, Agricultural and Rural Development: A Literature Review and Future Research Directions. The European Journal of Development Research. DOI: [10.1057/ejdr2014.60](https://doi.org/10.1057/ejdr2014.60)
2. D. Klosters, Matching Skills and Labour Market Needs Building Social Partnerships for Better Skills and Better Jobs, 2014, World Economic Forum Global Agenda Council on Employment, pp 7
3. The Institution of Engineering and Technology, (2015) Skills & Demand in Industry, survey, 2015, pp11
4. M. Prasanna, (2014), Information Technology: Roles, Advantages and Disadvantages, IJARCSSE, Volume 4, Issue 6, June 2014, pp.1022

5. Th. H. Davenport, (2013), *Process Innovation Reengineering Work Through Information Technology*, Ernst & Young Center for Information Technology and Strategy, Harvard Business School Press Boston, Massachusetts

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