ICT LABOR MARKET SURVEY IN ALBANIA: A CASE STUDY FOR HIGHER EDUCATION CURRICULA UPDATES

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ABSTRACT

Information and communications technology (ICT) has rapidly evolved worldwide by proving to be an essential and fundamental step in the development of modern society. While the job market tends to be adapted to rapid technological changes, ICT higher education institutions should carefully investigate this tendency by continuously designing appropriate educational curricula. Two surveys have been currently made, and the results are here reported, and recommendations made. The first survey takes feedback from the alumni of Faculty of Information Technology (FIT). The second survey evaluates the Albanian ICT companies / institutions hiring these alumni. In the present surveys a total of 160 alumni and 51 companies are involved.

Keywords: ICT, labor market survey, curricula, higher education institution

1. INTRODUCTION

Digital technologies are constantly evolving, and the ICT sector is of strategic economic importance.

The digitization of many sectors is one of the pivotal determinants behind the profound transformation of the labor market and the entire society works. As digitization creates new job opportunities, demand in manpower increases.

One of the primary objectives of universities is the satisfaction of this demand by equipping the graduates with appropriate level of knowledge. Curricula update based on ICT job market trends helps meeting the employment criteria.

The graduates' responses to the surveys and companies' policies in the framework of meeting employment criteria are here reported, and recommendations for improvement are here made.

Students graduated the last three years were asked about the relevance of the curricula used at the Faculty of Information Technology, Polytechnic

University of Tirana, Albania and the requirements at the working place. Several public and private companies involved in this field were contacted to give an opinion about their employees who graduated from this faculty. A total of 160 Alumni and 51 companies' respondents were involved. A quantitative and qualitative analysis was carried out based on the collected data.

The reminder of the paper informs about the literature context, the used methodology and the results. Conclusions and recommendations are finally drawn, and recommendations made.

Literature Context

There are many publications tackling the problems of the ICT job market, the university curricula assessment and the employability of the students through surveys. A considerable number of publications show the results of their research and make recommendations for the future.

The project "*The future of the work in ICT"* presents its research work in the report published in 2020 titled "*Skills shortages and labor migration in the field of information and communication technology in Canada, China, Germany and Singapore"* (International Labour Organization, 2020). The report states the shortage of skilled ICT workers many countries are facing, trends in the ICT sector and labor markets in Canada, China, Germany and Singapore, education and skills development, the international migration of ICT specialists, and finally key findings and possible policy responses. Another interesting report presents the trends and forecasts for the European ICT Professional and Digital Leadership Labor Market through the years 2015-2020 (Hüsing *et al*., 2016). The authors describe the results of their study regarding the e-skills supply and demand in Europe. In addition, they quantify the e-leadership workforce in 2015, and forecast the next 5 years. The Jordan Skills Standardization Organization, in collaboration with USAID and Information and Communications Association, Jordan, presents the Labour Market Study in 2016 to illustrate the employment of fresh graduates in the ICT sector of Jordan (JoSSOr, 2016). The study reports about the data collected from 136 companies.

Lakey (Lakey, 2007) in his study about the Northern Labor Market Information Clearinghouse assesses the employment opportunities and provides insights in the IT field within Northern Alberta. Although the study informing about the responses of 50 organizations dates back to 2007, its importance lies in the method applied, and it helps understand and compare the changed requirements of IT sector in the last 15 years. Regarding the South-East Europe IT Industry Barometer (SEE ITIB) project of 2015, its research team aims to collect information on ICT companies in the Western Balkan region and to provide insight on the national ICT market (Dakovic *et*

al., 2015). There were 126 enterprises included in the survey; 50 from Montenegro, 40 from Kosovo, 20 from Serbia, 7 from the Republic of North Macedonia and 9 from Albania.

An important study carried out by the Kosovo ICT Association (STIKK) informs about the recent trends in the ICT sector in Kosovo (Kosovo ICT Association, 2019). 38 IT companies operating in Kosovo were involved. The Daffodil International University made a survey on ICT job market in Bangladesh in 2019 (Daffodil International University, 2019). The report, which covers data collected from 384 organizations, aims to help the ICT professionals, policy makers, entrepreneurs in Bangladesh to get a clear picture of this sector and bring forth strategic decisions in the age of the Fourth Industrial Revolution. A novel approach is presented in the study of the Kenyan Universities (Passi-Rauste, 2019) regarding the use and evaluation new AI-based technologies for analyzing the labor market demand and help universities update their curricula.

Regarding the research papers, the University of Agribusiness and Rural Development in Plovdiv, Bulgaria published the results of the project "Updating curricula in University of Agribusiness and Rural Development (UARD) in response to labor market needs" in 2017 (Dimitrov *et al.*, 2017). The project aims to improve the curricula for deeper learning and skills development and competences to increase the training quality and the students' employability.

The last two reports we referred to are drafted by the researchers from the Office of the Quality Assurance, University of Gjakova, Kosovo, and could be found on the webpage of the university. The questionnaire, the answers and the results' interpretation regarding the evaluation of alumni's and their employers' feedback could be found in (University of Gjakova, 2020a; 2020b).

Another research paper is authored by the researchers from the Technical University Cluj-Napoca, Romania in the field of the civil engineering (Anastasiu *et al*., 2017). The research aims to discover the skills needed to be developed by the students from the technical universities to meet the job market demands. The employability of ICT graduates in South Africa is addressed by two similar papers. (Brink *et al*., 2019) report about the ICT unemployment, one of the biggest challenges of the country. The questionnaire got 220 responses from graduates of Applied Information Systems at the University of Johannesburg. Similarly, (Brink *et al*., 2021) aim to elaborate the opinion of the graduates regarding employability stress, reasons of unemployment and suggestions to overcome these challenges.

 (Koong *et al*., 2012) introduce the skills required in the ICT market through data collection from Monster.com and HotJobs.com, 2 popular internet job portals. The paper aims to help educators improve curricula, and

students select wisely the elective courses and choose an area of specialization. Ayofe and Ajetola (Ayofe and Ajetola, 2009) from the Fountain University, Osogbo, Nigeria, explore the gap between computer science curriculum and industrial IT skills requirements in Nigeria, and make recommendations with regard. Four different Universities from Australia undertook an online survey about the ICT curriculum, job requirements and graduating students meeting these requirements. They results could be found in (Koppi *et al.,* 2010) who strongly suggest a closer relationship between academia and industry.

2. METHODOLOGY

The method here applied is based on (Barros-Bailey, 2012) which describes a set of 12 steps to address a labor market survey. Some of the steps include identifying research questions, developing the survey, selecting the sample frame, collect, analyze, summarize, and report the data. The Microsoft Forms platform was employed for the two surveys with 16 questions each. One survey targets the alumni graduated from the Faculty of Information Technology (FIT) in the last 3 years. The other survey targets the companies or Institutions that offer IT services and/or need IT services at their core. Their feedback involved only the employees graduated from FIT.

Thirty alumni were contacted verbally or via email, and were asked to fill up the questionnaire posted on the website of the faculty. The companies/institutions were mainly contacted via email. Furthermore, the questionnaire's link was shared in the social media platforms. Some of the companies were involved under the partnership framework, while some other run the internship programs for the students during the academic year 2020-2021.

The time span of responses acceptance was approximately 40 days between September 2021 and February 2022. There are 160 respondents for the Alumni's survey and 51 respondents from the companies.

3. RESULTS AND FINDINGS

The forthcoming paragraphs inform about the survey content along with the responses as depicted in the Figure 1.

4.1 Survey for Faculty Alumni

There were 160 alumni from the FIT here involved. The average time to complete the survey was 7.5 minutes.

Q1. Select your gender.
A1. 43% of the interviewers were males and 57% females.

Q2. Which city do you work in?
A2. Ninety one percent of the interviewees responded that they were working in Tirana, and the reminder was employed in other cities in the country such as Durres, Elbasan, Fier, Shkoder, but also abroad (Oslo, Norway).

Q3. What is the education level earned?
This question opted: bachelor, master of science, professional master, and PhD.
A3. Seventy three percent of the interviewees had bachelor degree, 20% had master of science degree, 6% had professional master degree, and 1 % had PhD.

Q4. Which study program are you graduated in? The options to the question were: computer / electronics / telecommunication engineering.
A4. 45% of the respondents were graduated in Computer Engineering, 26% of them in electronics engineering and 29% in telecommunication engineering.

Q5. What was the status of employment when you finished your studies?
Q6. What is your current employment status?
The possible options for both these questions are the same: unemployed, full-time employed and part time employed.
A5, A6. Figure 1 depicts the results of employment status at the time of finishing the studies and at moment of the survey. More than 56% of interviewees were employed either part-time or full time, before finishing their studies. At moment of the survey, 81% of alumni were part-time or full-time employed. Most of the unemployed graduates belong to the bachelor degree category.

Fig. 1: The employment status of the interviewees a) at the time of finishing studies (question Q5) and b) the current situation (question Q6).

Q7. Is your job tied to your field of study? The answers can be yes or no.

A7. Seventy eight percent of the interviewees worked in the field of study they graduated in, and 22% work in other sectors.

Q8. Was the master diploma mandatory for the employment? The answers can be yes or no.

Q9. Was the professional certificate mandatory for the employment? The answers can be yes (Specify) or no.

A8, A9. 85% of the respondents stated that the master diploma was not mandatory, and 66% answered that a professional certificate was not mandatory. However, professional certificates are required after starting the job.

Q10. Are you working in the private or public sector?

A10. 9% of the respondents works in the public sector and 91% in the private sector.

Q11. Check all the IT services that your job provides:

The answers were: App developer, network and server administration, artificial intelligence, database, IT / helpdesk, antenna and radio communication, graphic & TV studio, design-configuration services and devices, medical device maintenance, mobile communication optimization, cyber and information security, academia and research, other (specify).

A11. Web, desktop and mobile app developer is the most provided job. Also, network and server administration and IT helpdesk were the most popular jobs.

Q12. Did you gain enough knowledge from university to help you get employed? Rate: 1 to 5.

A12. The average rating of knowledge provided from university to help students get employed was 3.2/5. This index shows a need to update curricula to better match the current job market requirements.

Q13. Rate from 1 to 5 the correspondence between university study programs and the job market requirements.

A13. Rating of the correspondence between university study programs and the job market requirements was 3.9/5.

Q14. Rate from 1 to 5 how much the internship helped you to get your current job.

A14. Our faculty equips the students with general knowledge and specific skills. With our curricula update we need to find the right balance between the two. The internship helpfulness was 3.7/5. It appears to be that internships have been helpful to the graduates.

Q15. Which of the skills are needed to be further enhanced during the academic studies? The answers opted: innovation, critical thinking, problem solving, research, soft skills, foreign language, work in group.

A15. Table 1 reports the answers in an ascending order. The 3 top skills voted are problem solving, critical thinking and research.

Q16. Suggest future enhancements to the FIT study programs. The answers were optional based on their needs.

A16. Some of the suggestions were: more programming classes with the latest programming languages such as Python, more projects from real life for problem solving to be carried out in teams, extension of the internship period, continuous assessment of students' education level (not only once a semester), more lab hours and optional courses, etc.

Table 1. The top 7 technical skills listed according to the answers of the 160 alumni.

Oder	Skill	Number of Alumni voting this skill should be enhanced
1	Problem solving	85
2	Critical thinking	81
3	Research	73
4	Innovation	70
5	Work in group	54

| 6 | Soft skills | 48 |
| 7 | Foreign language | 12 |

4.2 Survey for companies

There were 51 companies involved in the survey. The average time to complete was 9.6 minutes, and there is one representative response per company.

Q1. Name of the company

A1. There were 51 companies involved in the survey. 48 companies out of 51 are located in Albania, two of are located in The Netherlands and one in Sweden.

Q2. Main activity the company offers.

This question opted: computer science, electronics, telecommunication, and other services (please, define).

A2. We describe in an ascending order the services offered by companies. 43% the companies offer services in the computer science field. The reminder offers financial, banking, sports, engineering consultancy, business process outsourcing, cyber-security, tourism, business public agency, state police services. 24% of the companies belong to the telecommunication services category. 6% offer electronic services, and only 1 company, out of 51 is involved in the field of computer science, electronics, and telecommunication.

Q3. Main IT services the company produces/uses.

The companies opted multiple answers: programming, database, server and network administration, telecommunication services, electronic devices maintenance, IT support, embedded systems, cybersecurity, academy and research.

A3. The most popular jobs fall into the categories: web/mobile/desktop programming, network and system administration, database, information security, machine learning and IT support.

Q4. Have you signed any collaboration agreement with our faculty?

The answers can be yes or no.

A4. Only 16% of the companies stated that they had already signed an agreement with the university. The other 84%, representing 43 companies, have not established any institutional agreement with the university. This survey is a means to foster further collaboration with the companies.

Q5. Percentage of your IT employees graduated from FIT.

The possible answers are: less than 26%, 26-50%, 51-74% and greater than 74%.

A5. 9 companies (18%) replied that more than 50% of their employees graduated from FIT. 5 companies stated that 51-74% of their employees graduated from FIT, and 4 companies stated that more than 74% graduated from FIT. This feedback is of great importance for the faculty. 57% of the companies stated that less than 26% of their employees graduated from FIT, and 25% of the companies stated that 26-50% of their employees graduated from FIT.

Q6. Rate from 1 to 5 the level of satisfaction of your company with our students.
A6. The average result was 3.9/5.

Q7. Rate from 1 to 5 how much do the university study programs meet the job market requirements.
A7. The average result was 3/5.

Q8. Rate from 1 to 5 the level of understanding of job requirements from our students.
A8. The average result was 3.4/5
The highest result is related to the general level of satisfaction with our students. Then, the mean level of students understanding is 3.4. Both of these values reassure the quality of our students. They are quite skilled and well prepared for the marketplace. However, the least value of 3 shows the need to update the university curricula to adjust them according to the very dynamic field of ICT in Albania.

Q9. How much time of training is needed for a new employee to start working independently?
The possible answers are <= 1 month, 1-3 months, 3-6 months, >= 6 months.
A9. Most of the companies (37%) stated that their employees would need 3-6 months of training. In ascending order, 31% of the companies stated that their employees would need 1-3 months of training, 24% stated that their employees would need 6 months of training, and only 8% of the companies stated that their employees would need less than 1 training month.

Q10. Is the master diploma mandatory for the employment at your company?
Q11. Is the certain professional certificate mandatory for the employment at your company?

The answer for both these questions is Yes or No. If "Yes", please specify.

A10, A11. For both questions, the ratio is nearly the same. Most of the companies, (80% and 82%) do not require a mandatory master diploma or professional certificate to hire new candidates. Half of the companies that require a certificate offer mainly information security services. The number of the public entities requiring a master degree is 2 institutions. Three telecommunication companies require a master degree diploma, 1 academic institution requires it, and 3 companies offering financial, consultancy and artificial intelligence services, respectively, require a master degree diploma.

Q12. Which of the skills are needed to be further enhanced during the academic year? The answers are (multiple answers possible): innovation, critical thinking, problem solving, research, soft skills, foreign language, work in group.

A12. Table 2 report the answers in ascending order by number of companies voting the skill to be further enhanced during the academic tear. Top ranked are critical thinking and problem solving, followed by work in group.

Fig. 2: a) The percentage of the companies requiring Master's degree b) The percentage of the companies requiring certificates.

Q13. How many IT graduates are you planning to hire in the next 5 years? The possible answers are: None, 1-5, 6-10, More than 10.

A13. Forty nine percent of the companies stated they plan to hire more than 10 IT graduates, 29% are hiring 1-5 IT graduates, 16% are hiring 6-10, and only 6% (3 companies) is not growing their staff in the next 5 years.

Table 2. The ranking of the type of skills to be enhanced during the academic years

Ranking number	Skills	Number of companies voting the type of skill to be enhanced
1	Critical thinking	38
2	Problem solving	38
3	Work in group	35
4	Soft skills	30
5	Research	26
6	Innovation	21
7	Foreign language	12

Q14. Which fields are you willing to invest in the following years?

There are multiple answers opted, alike the question number 3.

A14. Top fields are web/mobile programming, information security and machine learning. Internet of things has a growing interest as well. Suggested in the comments were also Cloud Computing and DevOps.

Q15. Suggest future enhancements to the FTI study programs.

A15. In this text field answer, we got feedback from the companies on what we can improve for higher quality students. The engagement of the companies was impressive as 90% of them contributed with many ideas, to their insight. The most popular answers were: include trend technologies in curricula like cloud computing, cyber-security, Linux administration, machine learning, NLP, robotic process automation, digital assistants; increase programming skills and include latest programming languages in the study programs such as Python, advanced Java, JavaScript, Php, .Net, mobile programming; increase the timeline of internships; the curricula update should be more often on a regular basis; the projects should be more job-oriented; work in group should be encouraged; increase the problem solving and communication skills; closer collaboration with industry should be encouraged; career consultancy for the students; certifications through self-learning; etc.

Q16. Select collaboration possibilities you want to build with our faculty.

The multiple answers opted: Internships, Employment, Research and Projects, Laboratory / Infrastructure, Other (Specify)

A16. The companies are willing to collaborate with our faculty mostly through internships (38 out of 51), employment (34 out of 51) and Research and Projects (22 out of 51). Only 8/51 companies are open to invest through laboratories and/or infrastructure, which is a good start for increasing practical capacities at our faculty.

4. CONCLUSIONS

This paper analyses the gap between industry and academia, the ICT University curricula and the ICT job market in order to bridge that gap. Two surveys were made to obtain the information required involving the graduates (Alumni) from the Faculty of Information Technology, Polytechnic University of Tirana, Albania and companies hiring them. The following conclusions could be drawn: i) satisfaction level of the graduates and companies hiring them varies between 3 and 4 out of 5. However, further improvement is needed. Updating curricula based on the ICT job market requirements should be the starting point to be executed during the academic year 2022-2023, ii) the aim of adjusting curricula according to the job market, among other reasons, should be decreasing the training time from the companies for our Alumni, possibly by reinforcing the lab and project hours to be aligned with job market requirements, and iii) the level of employment is satisfactory. However, increased activity of career office at faculty level should be encouraged to better match the job market demand with graduates from our faculty. Our students generally start career in the ICT sector during their studies.

As this survey is the first survey organized at a faculty level, emphasizing its impact and expectations would be important.

Some of the positive results are as following: i) increased feedback from the graduates, ii) new contacts from the companies are found, new official invitations from them to collaborate with academia and several bilateral meetings and agreements are already established, and iii) an increasing interest from the business companies to contribute to a better academic process.

These results are presented to the leading structures and the staff of the Faculty of Information Technology and this document will be taken in consideration for: i) the improvement of the existing programs curricula update, ii) new master's program curricula, and iii) support the accreditation process of our study programs.

REFERENCES

Anastasiu L, Anastasiu A, Dumitran M, Crizboi C, Holmaghi A, Roman MN. 2017. How to align the university curricula with the market demands by developing employability skills in the civil engineering sector. *Education Sciences*, p. **7(3)**

Ayofe AN, Ajetola AZ. 2009. Exploration of the Gap Between Computer Science Curriculum and Industrial I.T Skills Requirements. *International Journal of Computer Science and Information Security*, Vol. 4.

Barros-Bailey M. 2012. The 12-step labor market survey methodology in practice: A case example. *The Rehabilitation Professional*, **pp. 1-10**, Vol 20.

Brink, Ohei KN , Roelien. 2019. Investigating the prevailing issues surrounding ICT graduate employability in South Africa: A case study of a South African university.*The Independent Journal of Teaching and Learning*, Volume 14 (2).

Brink, Ohei KN , Roelien. 2021. Employability Distress: Factors Affecting ICT Graduates' Employability and Work Integration in the Workspace. *Research in World Economy*, **pp. 138**, Vol. 12, No. 1, DOI: https://doi.org/10.5430/rwe.v12n1p138

Daffodil International University. 2019. Survey on ICT Job Market in Bangladesh 2018. Dhaka, Bangladesh, January 2019.

Dakovic M, Jankovic I, Dakovic G, Popovic A, Muratovic M, Scepanovic M. 2015. South-East Europe IT Industry Barometer (SEE ITIB), May 2015. *E3 Consulting Ltd. Montenegro*: Podgorica, Montenegro.

Dimitrov D, Ivanova M, Petrov P , Georgieva P, Arabska E. 2017. Updating curricula in response to labor market needs. *EURASHE 27th Annual Conference.* Plovdiv, Bulgaria

Gjakova University. 2020a. "Raport përmbledhës i vlerësimit të studentëve të diplomuar nga punëdhënësi", Kosovo 2020.

Gjakova University. 2020b. "Raport përmbledhës i vlerësimit të studentëve të diplomuar", Kosovo 2020.

Hüsing T, Korte WB, Dashja E. 2016. Skills & Digital Leadership Skills Labour Market in Europe 2015 - 2020. *Empirica GmbH*. Bonn, Germany.

International Labour Organization. 2020. The Future of Work in ICT – *Project Report*. Skills shortages and labour migration in the field of information and communication technology in Canada, China, Germany and Singapore. Geneva, Switzerland.

JoSSOr. 2016. The Jordan Skills Standardization Organization. Labor Market Study: Jordan.

Koong KS,. Liu LC, Liu X. 2012. A Study of the Demand for Information Technology Professionals in Selected Internet Job Portals. *Journal of Information Systems Education*, , Vol 13 (1), pp. 21-28.

Koppi T, Edwards SL, Sheard J, Naghdy F, Brookes W. 2010. The case for ICT work-integrated learning from graduates in the workplace. *12th Australasian Computing Education Conference (ACE 2010).* Brisbane, Australia.

Kosovo ICT Association (STIKK). 2019. Kosovo IT Barometer. Kosovo ICT Association (STIKK) Report.

Lakey S. 2007. Information Technology Related Skills and Training Needs in Northern Alberta. *Northern Labour Market Information Clearinghouse.* Northern Alberta.

Passi-Rauste, Ketamo H , Anu. 2019. Labor market analysis and curriculum gap assessment using big data in Kenya. *Headai Ltd.* Finland.