EDUCATIONAL POLICIES AND INITIATIVES FOR IMPROVED PERFORMANCE

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Abstract:

The information technology and communications (IT&C) became a utility of core importance in every company and it is of vital priority that the higher education institutions adapt to the labour market demand, in order to improve the educational process, the graduates' competency level and the meet the IT workforce demand in the IT sector.

The purpose of this paper is to identify educational policies that can lead to improved academic results in the IT domain, considering the main difficulties regarding the IT labour market development and the lack of education programmes that can ensure the necessary level of competency required by the market. The results consist in a set of proposals that aim to reduce the discrepancy between the professional IT workforce supply and employment demand on the Romanian labour market and to align with the objectives of the National IT Strategy.

The research is composed of three steps and includes exploring the Romanian IT labour market and building an evaluation model, analysing the relevant scientific literature regarding higher education, and conducting a case study based on the evaluation model. This study fills a gap with respect to the state of the art regarding higher education, the main supplier of IT professionals, and the means of increasing competency and productivity in the IT domain.

Keywords: labour market, business strategy, business intelligence, academic performance management

JEL Codes: P36, M15, L84

Acknowledgement: This work was co-financed from the European Social Fund through Sectorial Operational Programme Human Resources Development 2007-2013, project number POSDRU/159/1.5/S/142115 „Performance and excellence in doctoral and postdoctoral research in Romanian economics science domain".

1. Introduction

Education is one of the main drivers of sustainable development in knowledge economies, and human capital is one of the most important assets of a society and has an important role in attaining high performance. Higher education significantly contributes to human resources development and is recognized as a strategic priority. Economic performance is improved by increasing the mobility and adaptability of the human capital according to the technological process requirements [6]. Better education is thought to bring benefits not only in terms of wages and employment, but also regarding social outcomes like improved life conditions, reduced crime, improved health, etc. [6].

The educational policy can be equated with plans and educational programs, designed and implemented at sectorial level or globally, including policies at university, school, or class level (Cretu, C. et al. apud Dye, 1975, Jones, 1977) [2].

The national legislation regarding educational policies is still respecting the definition of Girod (1981), who states that the educational policy is a "coherent set of decisions and means by which the power (and especially government power) ensure data compatibility, for a period, between options, and fundamental educational and social constraints characteristic to the field in

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which they are applied" (Cretu, C. et al. apud Girod R., 1981 by Landsheere, V. & Landsheere, G., 1992, p. 23) [2].

The changes in the economy and the continuous advancement of technology urges the labour force to adapt to new conditions, produce something else, increase productivity, change work content, acquire new skills and qualifications, upgrade knowledge through continuous education and training during the activity. It is necessary that the Romanian economy develops the ability to absorb change and the labour market increases its adaptation capacity [6].

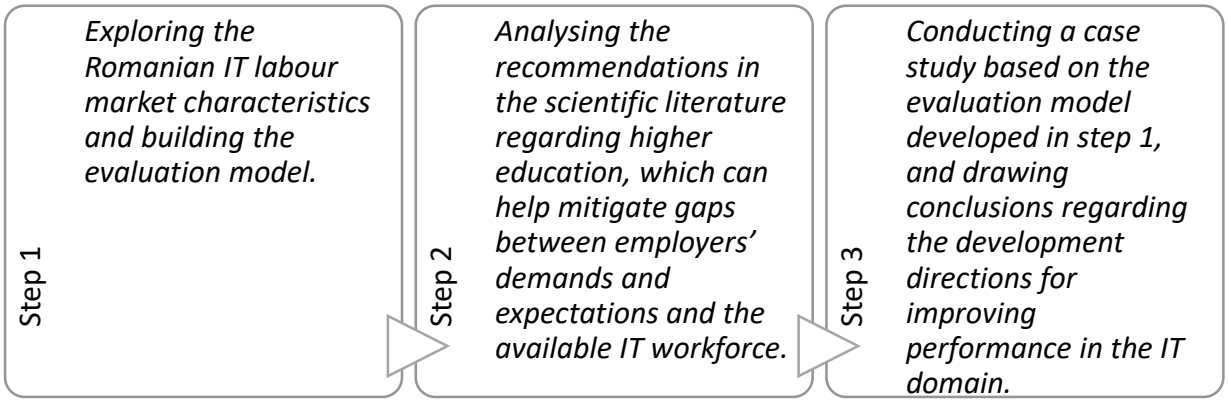
The information technology and communications (IT&C) became a utility of core importance in every company and it is of vital priority that the higher education institutions adapt to the market demand, in order to increase the number of IT graduates and to improve the educational process and the skills of graduates.

The purpose of this paper is to identify educational policies that can lead to improved academic results in the IT domain, considering the main training and development difficulties and the level of competency of the IT graduates. These proposals are targeted towards reducing the discrepancy between the professional IT workforce supply and employment demand on the Romanian labour market.

The paper is composed of five sections: the first explores the context and the challenges of the Romanian IT labour market, the second reviews the literature regarding the role of IT in the organizational process, the third presents the state of the art regarding the Romanian educational system and the problems and recommendations mentioned through previous studies, the fourth section presents how the evaluation model was build and the contribution of the paper, and the fifth presents the case study conducted in order to evaluate the difficulties regarding IT education and competency development. At the end, a set of proposals are formulated regarding higher education policies that could help mitigate deficiencies and lead to a better performance.

The research consists of three steps, as illustrated below (figure 1). The first step corresponds to sections 2, 3 and 5, the second step corresponds to section 4, and the third section corresponds to section 6.

Figure 1 Research steps



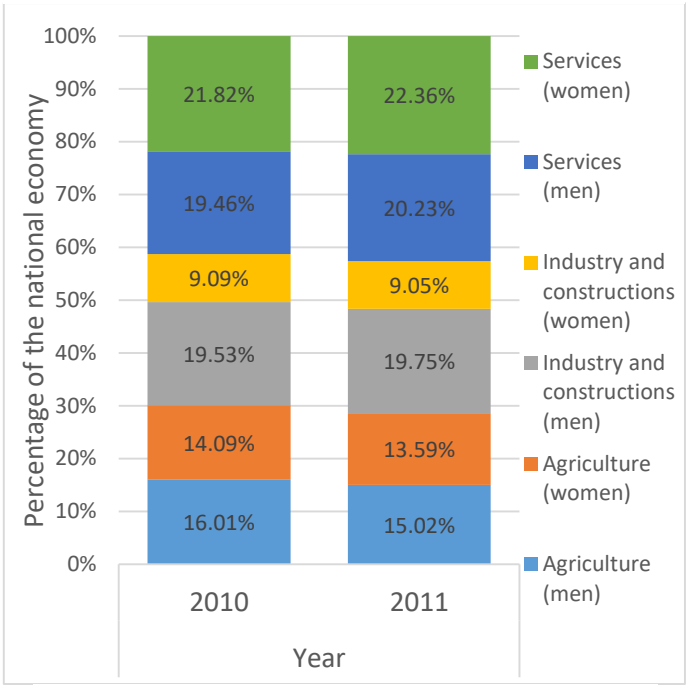
The next section explores the Romanian IT labour market and highlights the mismatch between the demand of IT professionals and the number of IT graduates, as there is a high demand in the science and technology domain, lack of training and unemployment rate is 0%. The development of higher education and continuous education institutions appears to be the main factor that can increase the workforce supply and its quality.

2. Context and challenges of the Romanian IT labour market

In the vast majority of literature, the labour markets are different one from another, not only in outcomes, in the sense of rewards in the form of the wages, conditions and careers, but also in the way in which they are structured and reproduced [1].

According to the "Key figures on Europe 2013 digest of the online Eurostat yearbook", with the aim of stimulating economic recovery, the European Commission set up the Europe 2020 strategy for smart, sustainable and inclusive growth. Two of its flagship initiatives concern labour market issues, namely "An agenda for new skills and jobs" and "Youth on the move". These promote a range of actions aimed at education and training institutions, measures for the creation of a (work) environment conductive to higher activity rates and higher labour productivity, and initiatives aimed at facilitating the entry of young people into the labour market. These two initiatives lead to the idea that flexibility in the labour market is thought to drive potential growth at the macro-economic level of each country [4].

Figure 2 Structure of the occupied population in economy areas, by sexes



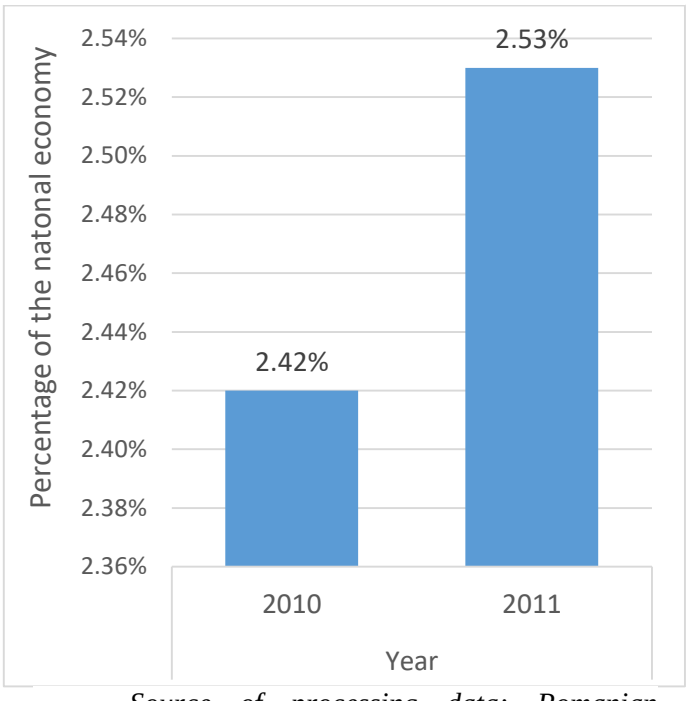
Source of processing data: Romanian National Institute of Statistics (INSSE), 2013

Following the same principle, in the past 20 years the World Bank and other partners of this institution have supported developing and transition countries in building viable educational and research institutions that can help to effectively transform these countries' stagnant economies into more dynamic and forward-looking economies.

In our study, we consider important in the analysis of the labour market in Romania the concepts of flexibility, Europeanization and industrialization. In the European countries, it is considered that flexibility, as well as globalization, technological and organizational changes are major drives of accelerated transformation in the economic environment.

The Romanian labour market is considered flexible, as the structure of the occupied population on economic areas, by sexes varies between 2010 and 2011 [17].

Figure 3 Variation of the average number of employees in the area of IT&C in the years 2010-2011, as percentage of the national economy



Source of processing data: Romanian National Institute of Statistics (INSSE), 2013

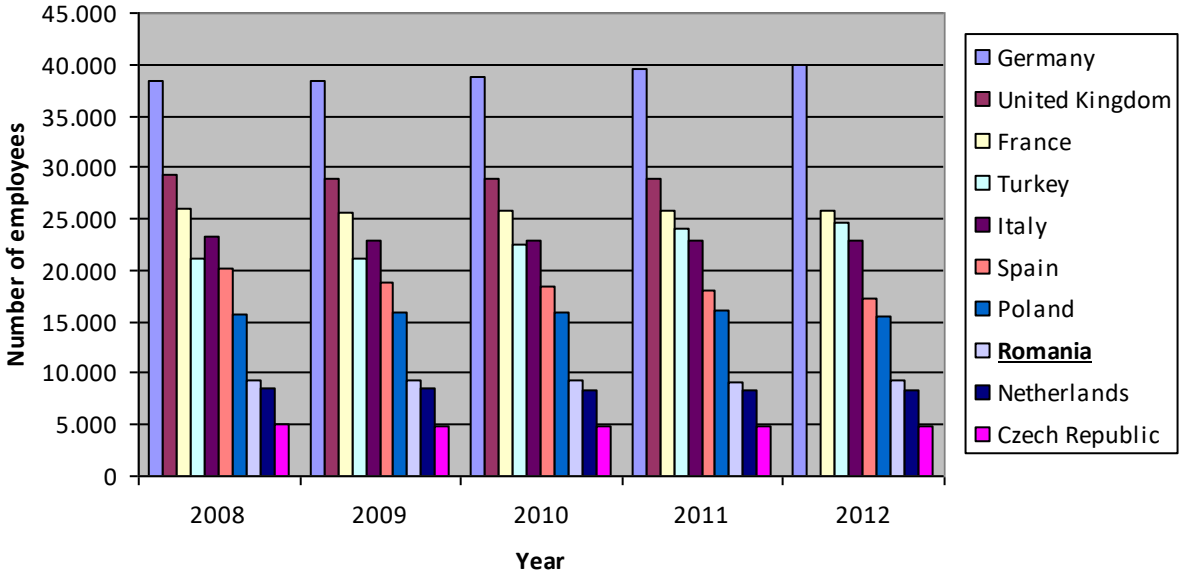
The data above show an increase of the occupied population in the services sector, and, at the same time, a decrease in the agriculture sector. This change indicates the degree of adaptability and flexibility of the labour market (figure 2).

Statistically, the medium number of employed persons in IT&C in 2010 and 2011 (figure 3) has increased significantly. The IT&C area had an increase of 0.11%, from 2.42% in 2010 to

2.53% to 2011, out of 100%, which represents the medium number of employed population in Romania [17].

The statistics below, regarding the population employed in technology and knowledge intensive sectors in the EU-28, show that Romania appears among the top ten countries by number of employees, but with a relatively small number comparing to the first five countries [5].

Figure 4 Top 10 countries in the EU by the number of employees in technology and knowledge-intensive sectors, 2008 – 2012



Source of the processing data:
http://epp.eurostat.ec.europa.eu/portal/page/portal/science_technology_innovation/introduction

In 2012, the share of scientists and engineers among those employed in science and technology occupations (HRSTO) was 22% in the EU-28 as a whole. Ireland (31.6%) and Romania (29.3%) topped the list, well ahead of the other member states.

In absolute numbers, the largest group of scientists and engineers was found in Germany with approximately 3 million, followed by the United Kingdom, France, Spain, Poland and Italy. These member states together employed 71.0% of all the scientists and engineers in the European Union [5]. Within the professionals group, Ireland (47.5%), Finland (45.2%) and Germany (44.6%) had the highest shares of scientists and engineers. However, many other countries also recorded shares of 40% or more, including Sweden, the United Kingdom, Switzerland, Romania, France and Spain [5].

According to latest estimates in the IT&C labour market, in Romania the unemployment rate in of IT graduates is near 0%, programmers having the highest demand.

Although the industry was shacked in 2008 by the crisis, the market registered an increase from 2012, and in 2013 this industry was the top sector in reporting positive commercial balance. In 2013 it was reported a 20% growth of commercial balance comparative to 2012 [17].

In 2012, a study of the Institute of Computer Technology (ICI) from Romania, mentioned that the increase in the IT&C sector is determined by the substantial increases in the hardware and software domains, which covered the repeated decreases in telecommunications. Although demand for IT professionals intensifies, does not reach pre-crisis levels and the labour market remains controlled mainly by employers [7].

Among the companies that have significantly increased the number of employees in Romania recently are Oracle, IBM, HP, GeBOC, Ubisoft, Endava, Gameloft, MGI Metro IT, iQuest, E.ON IT, Fortech, Computaris, Misys, Pentalog and Siveco.

In the area of software and services, gross annual average salary was 11,910 euros in 2011, up with 10% from a year earlier and more than 20% compared to 2008. A sub-analysis shows that the average is substantially higher in software development and publishing of software. Annual average gross wage in the hardware last year was about 6330 euros, up 5% from 2010 and up 12% from 2008. On the other hand, average gross annual salary in communications was 11,304 euros in 2011, up 2% compared to 2010 and more than 5% compared to 2008 [17].

The next section highlights the role of the IT systems in the organizational process and presents the policies concerning the development of the IT&C sector in Romania.

3. Role of IT in the organizational process

The creativity and talent of managers, together with the capabilities of technology can help modern companies turn challenges into opportunities, create new professions, products, markets and industries, and make commerce more social and mobile. IT&C managers and workers skills have to keep the pace with the evolution of technology, as nowadays, it is essential that Information Systems work effectively and reliably. Technology trends like social, cloud, mobile, and data analytics currently help businesses gain competitive advantages, expand market reach, develop new features or means of doing business, reduce costs, provide faster file and data management and ensure mobile connections with increased coverage [18].

The right information system architecture and the governance regarding software add-ons and updates, systems, networks, hardware, cloud services and other IT, cut costs considerably and increases productivity by helping executives, managers and workers to get access anywhere and anytime to the necessary information, collaborate, communicate and carry out their activity. Moreover, customers may benefit on any device from data and information from the IT systems that used to be internal, due to a greater variety of application access and new types of IT architectures and business models [18].

According to Microsoft, IT became a utility of core importance in every company. In this respect, the research shows it is of vital priority that the educational system adapts to the market demand, in the most suitable manner.

Figures available in the draft of the National Strategy on Digital Agenda for Romania, issued by the Ministry for Information Society, indicate that the IT&C domain will develop further. According to this document, “a full implementation of the strategic vision for the IT&C in Romania that will meet the objectives set for Romania will require a total investment of over 3.9 billion euros. The direct and indirect impact on the economy, calculated according to the good practices in other European countries which have made similar investments, can be translated into a 13% GDP growth, an 11% increase in employment, and a 12% decrease of management costs between 2014-2020” [12].

Also, according to the same document, 250,000 employees will work in IT&C in 2020, comparing to 128,000 in 2011: "If in recent years the IT&C sector recorded a slower growth in development and employment, this is due to the average growth rate of employment in the IT&C sector in Romania (7% per year) before the economic crisis, which was projected as a future investment target for 2014 – 2020” [12].

The implementation of these development policies will increase both demand and supply of IT&C professionals, and it is important that the higher education and professional training institutions adapt in order to improve the educational process and the level of competency of the graduates.

The next part presents a literature review on the recommendations regarding the Romanian higher education made through other research papers.

4. Other educational policy propositions

Few research papers address the dynamics of the Romanian IT labour market and the higher education issues regarding ensuring IT workforce supply, but some generic studies are relevant in the area of research that concerns this paper.

A study shows that whether the duty of preparing graduates for employment belongs to the universities, or to the employer, in order to supplement practical skills, there is an incompatibility between the perception of the academic staff and the employers regarding educational requirements. Employers see the quality of the educational content as average and mention a large gap between graduates' skills and what is required on the job, while academic staff have a positive perspective on the matter. The reasons are related to the effects of the Bologna process and the fact that, in general, employers are reluctant regarding training employees [15].

Higher education institutions will have to contribute to labour market analysis and collaborate with prospective employers. The evolution of the market and the uncertainty in the economic environment requires more efficient universities, a flexible curricula, long-term programmes, standardized evaluation and more social involvement of universities [15].

The policy proposals should also consider the brain drain and brain shopping phenomena, which could be reduced by improving employment conditions in Romania, both professionally and financially, and speeding the process of adaptation of the labour market to the changes in the IT, economic and social environment. Global Competitiveness Report 2009-2010 indicates that economic growth and sustainable human development can be achieved by decreasing migration propensity and retaining graduates in the national labour market [21].

Other propositions include [21]:

- periodically analysing the competencies desired by Romanian employers in order to ensure the success of their companies and guiding the adjustment of the academic curricula and frame learning outcomes and standards around the skills demanded by the labour market;
- developing forms of employment like project based, part-time, flexible schedule and online jobs, and employing technology where necessary, in order to automate some activities; encouraging entering the labour market after graduation and pursuing jobs corresponding to their level of education;
- guiding employers to recruit from the local, national or international market;
- encouraging employers' flexibility when graduates choose to pursue in parallel other educational programmes while they have a job; extending scholarship programmes for those who cannot afford higher education;
- adapting the evaluation and certification systems in order to verify both theoretical knowledge and practical competencies;
- establishing and applying solutions for monitoring the insertion of fresh graduates on the labour market; and
- developing flexible and efficient internship programmes for students.

Other studies conducted on different labour markets concerning the relation between the IT&C higher education institutions and the labour market considering supply, the evolution of technology and required competences.

Konwar and Barman (2011) proposed developing a competency-based curriculum as necessary measure in order to help higher education institutions to meet the demands of the labour market [9]. Mazurat and Schonwetter (2008) support the competency-based curriculum at undergraduate level as it is expected to ensure graduates the necessary knowledge, ethics, skills and attitudes [11]. Moreover, Kapoor and Chan (2005) consider the adequacy of university undergraduate programs should be examined in order to ensure graduates are technically competent [8]. Pate´-Cornell (2001) and Chi-kuang et al. (2005) consider the rapid technological advancement influences the industry and recommend that the content of the engineering curricula

is adapted according to the information and communication technologies evolution [13]. On the other hand, Sanz (2009) highlight the importance of developing personal competencies, as they are a key success factor in any professional domain [14].

Starting from these conclusions and recommendations, Turhan and Akman (2013) show that university reputation will become increasingly important to employers and the IT departments of the universities should continuously improve the quality and standards of education, collaborate with the industry, and analyse the IT curricula and the team-working and problem-solving skills of the graduates in order to obtain feedback. On the other side, employers should consider in-service training programs in order to get employees ready for work [19].

Kouwenhoven (2003) noticed that mainly in developing countries, higher education institutions have to contribute to mitigating the significant gap between their curricula and the demands from society, industry, and business in order to maintain a flexible highly-competent workforce, proficient in problem-solving, teamwork, project management, etc.[10]

On the other side, in industrialized countries workforce ages rapidly, the number of young workers is expected to decline over the next several decades, and companies will have to face new challenges regarding the demographic change in conjunction with the progressive adoption of modern information and communications technologies [16]. This implies that education institutions will have to create continuous education programmes to keep employees up to date with the high-tech innovations, support career changes and maintain the motivation and the neural plasticity of the active workforce.

All this research is centred on improving higher education and show that this is the starting point for reducing the gap between IT employment demand and supply and ensuring the corresponding level of competency.

The next part presents the evaluation model, the reason why the component factors were used and the contribution.

5. Evaluation model and contribution

In Romania, for the period 2007-2011 was reported a pronounced downward trend in the rate of enrolment in higher education compared with the period 2003-2007 as shown below [20]:

Table 1 Gross enrolment rate in higher education by location and gender (2003-2012)

	2003/ 2004	2004/ 2005	2005/ 2006	2006/ 2007	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012	Change 2012/2013
Total	37,9	40,2	44,8	47,2	53,6	51,7	45	40,8	33	-4,9
Urban	-	-	-	-	68	62,8	56	53,9	43,8	-24,2
Rural	-	-	-	-	30,9	33,9	27,2	20,8	18,7	-12,2
Feminine	42,6	45,1	50,8	54,1	61,7	58,4	50,7	45,7	36	-6,6
Masculine	33,5	35,4	39	40,6	45,9	45,3	39,5	36,2	30,1	-3,4

Source: http://vechi.cnfis.ro/Raport%20CNFIS%202012%20-%20Starea%20finantarii%20invatamantului%20superior.pdf

The gross enrolment rate reveals a significant decrease, from 53.6 %, in the school year 2007-2008, to 33%, in the school year 2011-2012 [20]. Taking into consideration the trend observed above (table 1), the Institute of Education Sciences, the universities and other institutions with a role in this matter, conducted studies on the risk factors that cause school dropout to increase and limit enrolment, and the following three factors were identified:

- Low motivation for school activities;
- High absenteeism;
- Learning difficulties.

The issue regarding low motivation for school activities and learning difficulties are presented also by other studies, like the 2011 report of the Romanian Agency for Quality

Assurance in school education, related to the graduation rate of less than 30 % at baccalaureate, were one of the most important reasons for poor performance of students was insufficient motivation and the inadequate attitude of students towards learning.

Moreover, statistics show that, compared to other EU countries, Romania has the lowest level of population aged 25-64 with tertiary education per 100 population, and this indicates that some measures are required in order to increase the level of education [6]. Higher education is an essential condition in order to stimulate international competitiveness, increase employment sustainably, achieve economic growth, and develop competent human resources. Aspects like decreasing efficiency of the higher education; increasing the number of academic degrees in domains not required by the labour market; and reducing the quality of acquired capabilities, because of insufficient financing, difficulties in adjusting to European standards, etc. are risks that affect Romanian higher education [15].

A study conducted by the National Authority for Qualifications, in partnership with National Commission for Professional Qualifications (CNCP (France), Polytechnic University of Bucharest and one of the four universities from Romania ranked in QS World University Rankings 2012, University of Bucharest, from the EU funded project "Developing an operational qualification from higher education in Romania – DOCIS") concluded that in order to increase the level of participation in the academic studies, it is necessary to analyse the perception of direct and indirect beneficiaries of higher education on how the studies will meet their expectations. The study also shows that the higher education system fails to provide graduates the necessary theoretical knowledge, and that only 33% of the practical skills were assimilated, according to the curriculum. Both graduates and employers consider that practical skills are important in order to find the first job.

This hypothesis is well evidenced in the Europe 2020 Report on Romania, which considers that in Romania matching education with employment is an important issue. The report also highlights the skills necessary for technological innovation and absorption of the new technologies as highly desirable by the employers in Romania. According to Valeriu Nistor, General Manager IBM Romania, the quality of the educational system must be improved with targeting methods in order to produce the graduates that the IT industry needs.

The findings regarding the mismatch between education and employment, lack of proper training, the need for professional competency lead us to the conclusion that higher education policies can and must help attain higher performance in IT&C sector in order to deliver as tangible target the strategic objectives mentioned in National Strategy on Digital Agenda for Romania in the period of 2014-2020.

In order to determine what kind of policies can contribute to solving the problems presented above, we have developed an evaluation model and conducted a case study. The objective of the case study is to help fill the gap between supply and demand on the IT labour market, and increase the graduation rates and academic results. The case study was conducted during a semester, and the performance and feedback of two groups was evaluated based on the laboratory activity of the Database Management Systems (DBMS) discipline taught in the second year of university studies.

The **evaluation model** comprises three dimensions, coherent with the findings presented in the studies mentioned above: **academic results**, **learning motivation** and **attendance**. The model was built according to the root causes of issues affecting the Romanian educational process and is further applied to evaluate the laboratory activity corresponding to the DBMS discipline. The competencies regarding database management are required on the IT labour market. The main causes that affect the Romanian educational process concern three factors, which correspond to the coordinates of the laboratory activity analysed. The case study analysis tries to identify the values of these factors and the determination relations between them, in the context of IT higher education.

Following a discussion with the students, it was observed that students in one of the groups are less motivated to study the Database Management Systems discipline because they considered it unnecessary for their future career, and most of them just wanted to promote. The difference between the two groups was the sense of purpose, thus one group perceived the laboratory applications as learning exercises in the teaching context, while the other asked continuously for a connection with the activities in the professional environment.

The analysis tool used is Microsoft Excel and the correlations between results were calculated using the following formula:

$$Correl(X,Y)=\frac{\sum(x-\bar{x})(y-\bar{y})}{\sqrt{\sum(x-\bar{x})^2\sum(y-\bar{y})^2}}$$

This study fills a gap with respect to the state of the art regarding higher education, the main supplier of IT professionals, and the means of increasing competency and productivity of the IT workforce in order to reduce the discrepancy between the demand and supply on the IT labour market and align with the objectives of the national IT strategy.

The next section presents the case study regarding the IT higher education, where the academic results, learning motivation and attendance factors are evaluated, the determination relationships are identified and the conclusions can be used in order to formulate recommendations in order to attain the objectives mentioned initially.

6. Case study regarding IT education

It is generally accepted that in order to increase the level of participation in the academic activities, it is necessary to analyse the perception of direct and indirect beneficiaries of higher education on how the studies will meet their expectations.

During a semester, the academic results at the laboratory activity of the Database Management Systems (DBMS) discipline were analysed for two groups that had a different motivation level:

a) Group A (26 students), which considered the subject is not necessary in their future career, and studied only in order to pass the exam. Students were not interested in explanations regarding the relevance of the applications in a professional context.

b) Group B (25 students) requested that all applications are presented in a current professional activity context. One student pointed that she cannot seek a method to solve the

Figure 6 Number of students by group and by grade obtained, including students without assignments sent

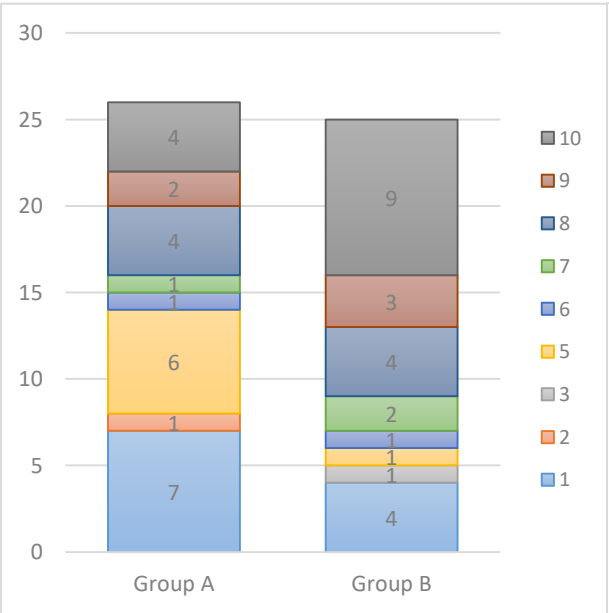
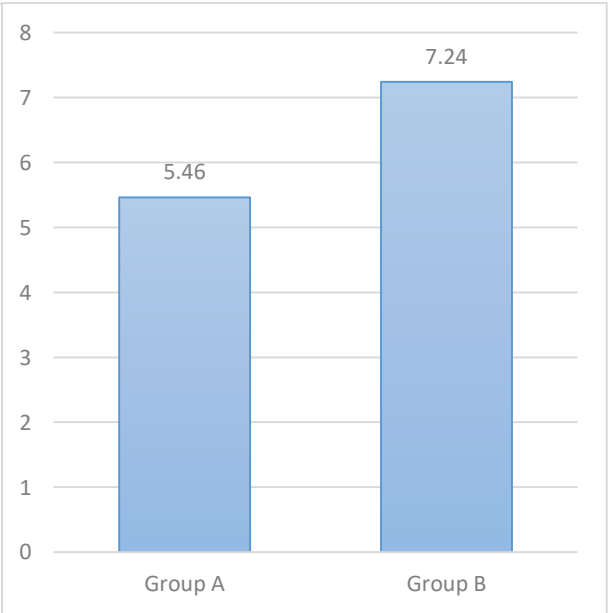


Figure 5 Average grades by group, including students without assignments sent

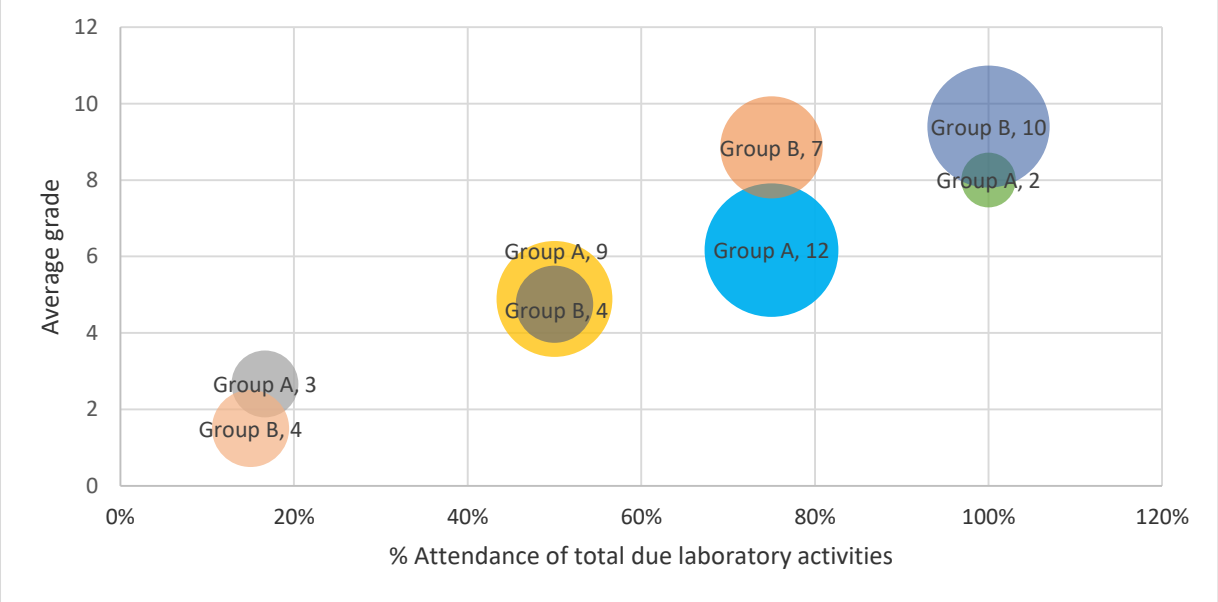


application because she does not understand the purpose of the application and how it would be useful in a professional activity, so requirements were developed according to the responsibilities undertook by a reporting specialist, database analyst or other financial professionals.

The students in the second group were more engaged in the laboratory activity and participated more in discussions about solutions (figure 6). From the total number of 51 students in the two groups, 38 (75%) obtained passing grades, 18 from group A (69% from the total of 26 students), and 20 from group B (80% from the total of 25 students).The level of motivation was subjectively appreciated, but the observation regarding the difference between the results of the two groups validates the hypothesis. As represented in figure 7, Group B had results 33% higher than group A. At the same time, in group A there were 7 (27%) students, while in group B 4 (16%) students who did not complete their assignments and did not pass for that reason. If the students who did not send their assignments are excluded from the average calculated by group, then group B had results 19% better.

Besides motivation, students' results may be influenced by factors like attendance at laboratory activities, profile of previous studies, familiarity with the database management systems used, and other aspects. Demonstrations and explanations greatly facilitate understanding and assimilation of skills and information transmitted during IT laboratory activities.

Figure 7 Average grades split by level of attendance for both groups, where the diameter corresponds to the number of students in each situation



The chart above shows the average results of the students at the DBMS laboratory activity, split by group and the percentage of attendance from the total number of activity hours. On the X axis are represented the average grades obtained by students at the laboratory activities, on the Y axis there are the levels of attendance from the total number of hours scheduled during the semester, expressed in percentages, and the diameter of the bubbles shows the total number of students which belong to each category.

The attendance and academic results show that group B has a greater interest in the subject and the laboratory activities, while group A is represented better in the part of the chart where grades are below 5 and attendance is <=50% from the total number of hours scheduled. The average grade and the general level of attendance by group indicate that most students in group A are interested to pass the exam with minimum grades.

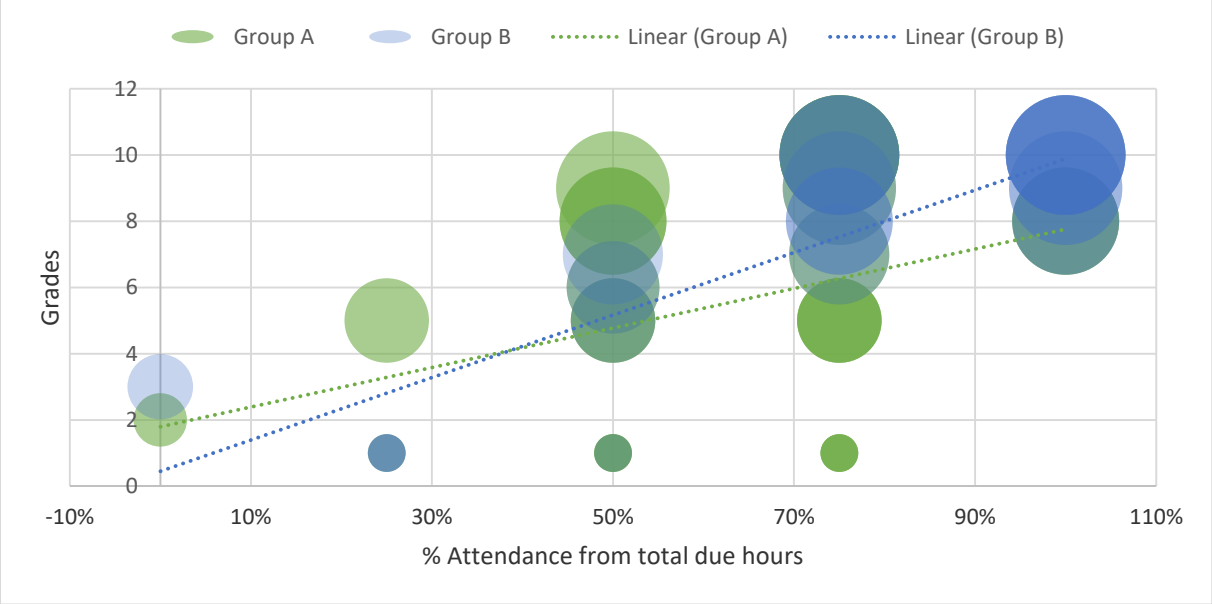
From the 44 students who attended more than half of the laboratory activities, 37 (84%) obtained passing grades: 17 students from group A (65%) and 20 students from group B (80%). In group A, the most interest to get better results was shown only by 4 students, representing 15% from the group, who obtained maximum grades and attended more than half of the laboratory

activities. The number of students in group B with passing grades is 11% higher than in group A, as seen at the beginning of the chapter, and average attendance was 17% better in group B compared to group A. Surprisingly, in group A 88% of the students attended at least half of the laboratory activities, while in group B 84% of the students attended at least half of the laboratory activities. This shows that motivation to obtain passing or good grades made most of the students in both groups to attend at least half of the laboratory activities, but the interest to develop IT skills and obtain very high marks has a small influence on the level of attendance.

The 12 students with perfect (100%) attendance, who sent the assignments, obtained average results of 9.16 out of 10. Ten students in group B, who attended all activities and completed their assignments, got 9.4 points out of 10, while the two students in group A obtained an average grade of 8. Thus, time dedicated to exercise in applied disciplines led to better results in the case of the group that is better motivated, even though the amount of time spent is similar. At the same time, more students chose to be present at more activities and interacted more compared to students that are motivated only to pass the exam.

On the other side, there are 7 students (14%), from the total of 51, who did not attend at least 50% of laboratory activities and got an average grade below 4. By exception, one student got passing grades even though attendance was below 50%. This aspect can be explained by the fact that some students are motivated to finish their assignments and get the study materials, even though they cannot attend the laboratory activities.

Figure 8 Correlation between grades obtained by students and percentage of attendance at laboratory activities, by group



In the chart above, on the X axis are presented the individual grades obtained by students, on the Y axis there are the levels of attendance at laboratory activities, the diameter illustrates the grades, the results are coloured to distinguish between the two groups, and the linear trend lines highlight the correlations between the grades and the level of attendance.

Analysis shows that between the variables grades and level of attendance, corresponding to group A there is a positive weak correlation of 0.396. The main reason for which the result does not indicate a stronger correlation is that some students (23% from group A), although attended more than half of the laboratory activities, did not complete their assignments in order to obtain a passing grade. In the case of group B the correlation is 0.86, which shows there is a strong positive connection between the variables analysed and the higher grades are determined both by the level of attendance and by motivation.

The discipline analysed is very practical and solving applications is the best way to assimilate the content. Still, results may be influenced by previously acquired IT competences, as

it is not an introductory course and is based on knowledge taught in IT courses in the first year of studies.

As a remark, based on the figures regarding group A, in order to obtain good results, students with average and low motivation levels should participate in at least 50% of the laboratory activities and complete their assignments, in order to get good or passing grades.

The overall correlation between grades and attendance is 0.661, which is a positive moderate result. In this case, it shows increased attendance in laboratory activities helps students have better academic results when they are motivated to learn thoroughly and for other reason than passing the exam. As a rule it can be stated that in order to obtain good or passing grades, students should attend at least half of the laboratory activities.

This correlation level appears to be negatively influenced by the inconsistency between performance and attendance in group A, related to a low level of motivation. For a part of the students, attendance did not reflect in good or passing grades, because they were not well enough motivated and did not manage to complete their assignments. On the other hand, 4 students managed to get maximum grades, even though they participated only in 75% of the laboratory activities.

The limitations of this study case relate to the fact that the population and the analysed period are reduced, and some students came sometimes at the laboratory activity of the other group, and this aspect was not monitored.

7. Conclusions and recommendations

The most recent studies regarding the IT labour market and higher education in Romania show that the educational process does not succeed to teach the necessary knowledge and skills, which are required by the employers. In the IT sector the unemployment rate is 0%, and at European level the demand for engineers and scientists is still greater that the number of professional available on the market. IT became a utility of core importance in every company and it is essential that the higher education system adapts to the market demand.

The findings regarding the mismatch between education and employment, lack of proper training, the need for competency development lead us to the conclusion that higher education policies can and must help attain higher performance in IT&C sector in order to deliver as tangible target the strategic objectives mentioned in National Strategy on Digital Agenda for Romania in the period of 2014-2020.

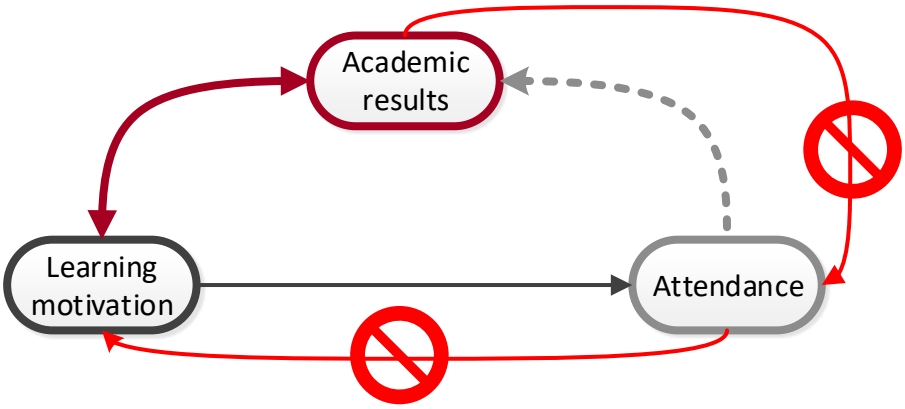
Several studies indicate that low motivation for school activities, learning difficulties and high absenteeism are the main factors that negatively impact the development of competencies and the availability of training.

In order to determine what kind of policies can contribute to solving the problems presented above, we have developed an evaluation model and conducted a case study. The evaluation model comprises three dimensions, coherent with the findings presented in the studies reviewed: academic results, learning motivation and attendance. Based on the results of the case study, the influences between the constituting factors were identified, and they are illustrated in the model below (figure 9).

The overall correlation between grades and attendance is 0.661, which is a positive moderate result. In this case, it shows increased attendance in laboratory activities helps students have better academic results when they are motivated to learn thoroughly and for other reason than passing the exam. This correlation level appears to be negatively influenced by the inconsistency between performance and attendance in the group having a low level of motivation. As a rule it can be stated that in order to obtain good or passing grades, students should attend at least half of the laboratory activities. Time dedicated to exercise in applied disciplines resulted in better results in the case of the group that is better motivated, even though the amount of time spent is similar. At the same time, more students chose to participate in more activities and interacted more compared to students that are motivated only to pass the exam.

Students in the motivated group (B) had results 33% higher than the less motivated group (A), and 11% more students in group B obtained passing grades. Moreover, the average attendance rate was 17% better in group B compared to group A. Surprisingly, in group A 88% of the students attended at least half of the laboratory activities, while in group B 84% of the students attended at least half of the laboratory activities. This shows that motivation to obtain passing or good grades made most of the students in both groups to attend at least half of the laboratory activities, but the interest to develop IT skills and obtain very high marks has a small influence on the level of attendance.

Figure 9 Model regarding the determination relations between academic results, attendance and learning motivation



The results of the case study and the constraints mentioned in the studies reviewed show that educational policies in the IT&C domain could have a positive effect on the labour market and help mitigate or solve the issues found on the medium or long term.

Factors that are recommended to be considered, in order to eliminate the bottleneck in the IT labour market and increase the quality of graduates and promotion rate are the following:

- Establishing a minimum attendance level should be mandatory in order to ensure students are promoting the IT or applicative disciplines, and higher rates of attendance should be rewarded.
- Introducing motivational incentives and connections with real and actual professional activities through the tasks and activities carried on.
- Organizing internships in the most demanded domains from the first year of studies.
- Facilitating online courses and activities for home studying.
- Establishing evaluation standards so results can be comparable among faculties of universities.
- Encouraging students to pursuit international competency certifications.
- Choosing technologies and updating the content of the programmes according to what is demanded on the labour market, so students can easily find a job after graduation.
- Introducing IT courses at faculties with different majors in order to enable future employees to use technology more productively.
- Increasing the number of hours allocated to laboratory activities and making connections with other courses in the curricula.
- Organizing events or conferences and invite researchers, company representatives or other professors in order to have a clear view on the directions that technology is going to evolve.
- Promoting teamwork and collaboration between students through the assignments given during the laboratory activities. If a student skipped a class, he/she should be determined by colleagues to catch up and continue his/her part of the task.
- Organizing career orientation events and labour market analysis in order to determine what is required and what the perspectives of various professions are.
- Developing a culture for continuous education in order to develop competencies according to technology advancements and changes in the work environment.

Compared to other recommendations or educational policies proposals, the solutions mentioned above aim to improve the IT educational process at university level and support

competency development at the level demanded by employers. The study takes into consideration the fact that higher education is the main supplier that can contribute to increasing the IT professionals group and ensuring the corresponding level of technical competency in order to meet employers' demands.

This approach is based on an evaluation model built according to the main causes of issues affecting the educational process in Romania and is supported by previous findings. Thus, the model is made of three factors: academic results, learning motivation and attendance, which were analysed based on the case study regarding the evaluation of an IT discipline from the undergraduate curricula. The analysis tries to highlight the degree these factors are affected in the context of IT higher education in order to propose solutions regarding the coordinates of the learning activities and can trigger positive effects on the labour market.

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