



Use of Information Technologies in Higher Education From The Aspect of Management

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Abstract: The development of modern information-communication technologies has enabled the development of electronic knowledge distribution channels that expand the effective level of general and specialist education. This trend is also present in higher education because higher education institutions and institutes increasingly rely on the use of modern information-communication technologies in their operations. The effects of the use of personal computers, the Internet and global social networks are multiple in the higher education system as well. In the process of acquiring new knowledge, developing creativity, as well as ensuring greater activity in the process of education, new learning technologies, with the use of multimedia systems, created the prerequisites for the engagement of all individual and collective resources. The most important source of the state's competitive advantage is the ability to educate and retain highly educated personnel in the field of information technologies. From that aspect, the paper discusses information technologies as a scientific discipline and general conditions for education in the field of information technologies. The impact of technical and pedagogical changes on education in this area is analyzed with particular attention. It is known that information technologies are suitable for vocational education, and the modern environment sets specific requirements regarding the applicability of knowledge acquired in higher education institutions. The dynamic and turbulent market emphasizes the applicability of knowledge as a key requirement in the educational process. These short researches propose new educational modules that should structure teaching in the field of information technologies in accordance with the global demand in this sector. Every society strives for a more efficient and economical system of education, and therefore the issue of the use of new information technologies in education comes down to the problem of creating a theoretically ideal model of the use of these technologies at all levels of education and work.

Keywords: information technologies, higher education, management, learning, knowledge.

Introduction

The education of young, highly educated personnel, that is, the education of students at faculties, as well as the continuous education of employees in the information technology sector (training) in conditions of long-term structural and financial insecurity can be the main source of competitive advantages and one of the strategic models for exiting the social crises. It is a well-established opinion that informatics and information technology are important contents of the educational process at all its levels, starting from preschool to university. The progress achieved in the development of new technologies, starting with personal computers, through networking - the Internet, has led to the creation of new opportunities for innovating and transforming the educational process, first of all in the developed countries of the world, but increasingly in our country as well. Current and future students expect from the educational system numerous innovative and alternative opportunities to improve their knowledge. The dynamic development of ICT enables young people, and above all students, who are being educated, greater independence and a good basis for self-education and permanent education. This is precisely what indicates that even those who are about to go on to university education will spend their entire working life and life in a permanent relationship with information technologies. However, they should, already during the process of their education, be trained for the effective application of new technologies that represent suitable teaching

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and then working tools. These technologies provide the possibility of controlling, regulating and managing the teaching process. Continuity is reflected in the management of the work process and success based on continuous feedback that motivates to a good extent and then represents the basicity of the evaluation process system and fair assessment of employee performance and progress in the level of education. In numerous theoretical discussions, the starting point is that traditional, mechanical, passive educational processes, in which there are no transactions in teaching, should be greatly and radically reduced. Bearing in mind that the computer has become a part of everyday life in the economy and in the domain of the work process, as well as a part of everyday life in free time, in the household and in every other human area, the question arises about its indispensable place in the innovation of education and its positioning in that complex process, in general.

Information technologies and manager education

Modern educational processes for the outcome have an investment in human resources that is profitable for all economic and non-economic subjects. Especially in the conditions of general crises, business entities are interested in organizing practical training of innovators and managers who, thanks to the effective use of the latest information technology, would ensure the efficient operation of the company and the conquest of new markets. This includes significantly raising the level of innovation and quality of higher education in the field of ICT and striving to raise it to the highest possible level.

From the perspective of the operationalization of educational processes, there are still different opinions about what are the elements, that is, the main factors that promote education in the field of entrepreneurial activities and information technologies. Many experts believe that the existing education system does not provide the appropriate competencies that are needed in modern conditions of frequent and constant changes in the environment. From this aspect, the paper analyzes the role of education in the field of information technologies, in the time of constant changes and growing global competition, in all segments of economic and social life. The dynamic and exponential development of ICT has conditioned the increased role and importance of education in this area, and it is becoming more and more evident, both in the world and in Serbia and the surrounding countries. However, in order to prepare pupils and students for the dynamic conditions of modern business and the challenges of innovation, it is necessary to change or improve the existing education system. Traditional methods and courses do not ensure the effective application of acquired knowledge. Many experts, therefore, believe that a new approach is needed in modern education, where the emphasis is placed on the acquisition of practically applicable knowledge and skills that are in demand on the global market and relate to effective management in all areas. It is undeniable that the development of computer science and new technologies represents a long dynamic cycle. The digital world has become a support for everyday life, but also an essential lever in the globalization of the world. Computers are integrated into modern culture on the one hand, while on the other hand, they are recognized as a leading force in the growth of the world economy (Vrhovac et al., 2017). With the emergence and intensity of the development of Industry 4.0, which shortens the life cycle of products, new technologies are implemented in that area and taking into account its exponential growth and development (the so-called clock speed industry). It also shortens the usage life cycle and improves the management (Hermann, Pentek and Otto, 2015). In addition, the accelerated development of new technology has decisive importance on the effectiveness of the education system and refers to numerous techniques, methods and contents. For example, networking and the Web have become a critical basis of computer technology, but also one of the most important pedagogical tools, leading to changes in the concrete educational system, not only in computer science but also in other areas (Bernon, Rossi and Cullen, 2011). In situations where we talk about the process of education and acquiring new knowledge, that process has always ranged from traditional learning, learning through audio lessons, video lessons, electronic learning, and distance learning, to today's mobile learning. Professors and teachers, adapting to new technologies, correct their position and role in the education process, but its basic function is still dominant. Namely, although globalization in the field of informatics allows students to visit distant museums, and archaeological sites, and communicate via video conferences, the lecturer is still present to direct and teach them critical thinking, social behaviour, work discipline, and personal responsibility, which guides them towards model recognition and the mentor's work style, i.e. develops and supports curiosity, which directs them towards conclusions and, eventually, scientific contribution (Bogdanović, 2009). Therefore, new technologies greatly contribute to a new way of learning, because at every opportunity the expansion of the Internet and the complex information technologies affect all domains of life in the world and in Serbia, as well as in the domain of the educational process. This technology is definitely the most advanced technology that has been devised in the history of human civilization.

Adaptability to the new way of (digital) learning

Modern information and communication technologies, i.e. computer science, have influenced all segments of life and work, but also leisure time, methods and models by which the educational process takes place at any level and the way in which new information is adopted. Precisely for this reason, it can be considered that the information revolution is not only technological, but to a large extent sociological and ethical (Bogdanović, 2010).

A new approach to the organization of the educational process, i.e. scientific and educational work, was made possible by the effective use of information and communications technology. This approach emphasizes and initiates a faster development of the individual abilities and interests of students. In addition, it enables faster and more efficient transmission, transfer and absorption of knowledge, and closer ties between students. Then, and with the formed database, encourages activity, independence and engagement of mental power and creativity of students. This possibility of activating pupils-students and their independent work is the basic characteristic of the basic process, which is greatly supported by the computer (Vilotijević, 2007, p. 12). Consolidated, changes in teaching and overall education have been influenced by technical, scientific and technological advances and innovations. Then, the introduction of new approaches in the organization of educational content into the teaching process brings about significant changes. Major changes are taking place, such as the introduction and application of new procedures, methods, techniques, means and media. Modern educational technologies have become an integral part of the teaching process, with the tendency not only to improve the teaching process but also to fundamentally change it. Multimedia, as a part of information technologies, is often used in teaching, so it can be concluded that multimedia is an important feature of the modern education system. Considering the fact that the centre of gravity of the teaching process has already begun to shift out (from the teaching content and the teacher to the student), multimedia undoubtedly has a great contribution to the modernization of traditional teaching (Vilotijević, 2007, p. 14). However, on the other hand, it should be borne in mind that so-called mobile learning is a kind of distance learning (d-Learning) and electronic learning (e-Learning). Therefore, experts believe that it is necessary to enable the student to create his own constructions of knowledge acquisition. It is considered in this way this constructivist approach represents the position that effective multimedia teaching strategies should be created and shaped, which enable different ways of learning. In these theoretical frameworks, the importance of multimedia influences and semantically rich transfer of information lies in ensuring the possibility of self-realization, i.e. affirmation of the needs of all students, which enables them to acquire new knowledge, develop abilities, acquire skills, habits and form attitudes (Krneta, 2007). From the application aspect, many experts are in favour of constantly innovating the knowledge of teachers, who should permanently acquire new knowledge, understandings and approaches. In addition, under the influence of ICT, it is desirable to set new attitudes and a changed role in the education process. This means that more versatile forms of professional profile and development are necessary because the profile of the educational process, in the Internet domain, is well dependent on the latest information and communications technologies and the ability of educators to understand and accept the "electronic alphabet" as the basis of a modern model of education.

The technology of telephony and computing has created increased mobility, so communication and connectivity (networking) are now understood at every moment and in every place. Connectivity that provides access to information in any situation has become a common occurrence in everyday life. Several billion inhabitants have access to the Internet, wired and wireless, and the number of devices that will soon be connected to the Internet will be tens of billions (Internet of things). However, while the previously wired connection was the rule and wireless the exception, now it is the other way around: wireless is the rule and wired is becoming the exception. Technical changes in the last decade have increased the content of many teaching contents, such as (Pokorni, Kuleto and Radić, 2018):

- World Wide Web and its applications ,
- Network technologies, especially those based on TCP/IP,
- System administration and maintenance,
- Graphics and multimedia,
- Web systems and technologies,
- Service-oriented architecture,
- Electronic commerce technologies,
- Relational databases,
- Client-server technologies,
- Interoperability,
- Integration and development of technologies,

- Object-oriented programming,
- More perfect programming interfaces (APIs)
- Human-computer interaction,
- Security,
- User domains

The above contents (as well as many others that will undoubtedly be introduced and developed in the very near future) are the practical result of the extraordinary progress and expansion of the effective application of information and communications technologies. The Internet and the Web contributed the most to the increase in the number of study areas and applied and theoretical programs in information technology. On the other hand, in addition to quality, a special problem can be the availability of labour. The quality of implementation of educational programs for future IT experts will depend on the availability and structure of study programs. In this sense, there are different goals, contents and teaching methods. Students' interest in self-employment should be encouraged during their studies. Graduate students need practical help - concrete support for their business ideas. The training program for IT activities should be aimed at acquiring knowledge and skills that will enable students to be:

- creative/innovative, highly motivated, self-aware, confident,
- communicative, courageous when making decisions, leaders-negotiators, managers,
- less dependent, ready to take risks, able to recognize opportunities

Under certain conditions and appropriate modification for the field of IT, it is realistic to create different programs for different groups of students with special reference to the following aspects of the application of entrepreneurship (Lajović, 2011, p. 264):

- Entrepreneurship within business schools and economics studies focuses on business startups and new venture creation and on the management and growth of SMEs. Students of economics learn to work with students from different fields (engineering, scientific studies, etc.).

- Entrepreneurship within science and technology studies is especially concerned with exploiting intellectual property, creating spin-off companies and venturing, and offering courses on issues such as: management techniques; marketing, commercializing and selling of technology-based ideas; patenting and protecting technology-based ideas; financing and internationalizing high-tech ventures.

- For students of the humanities, the focus is on social entrepreneurship, the development of the area that provides an opportunity for advancement of the community;

- Entrepreneurship for the creative arts and design focuses on opportunities emerging through creative working, preparing graduates to work as freelancers or self-employed people, or creating small enterprises and ventures.

Respecting the existing differences between entrepreneurship as a general term and IT entrepreneurship as a special term, it is possible to create an adequate plan of activities that would adapt the elements mentioned above to new IT-specific content.

The importance of the Internet in distance learning

In the second half of the nineties of the last century, there was an expansion of information and communications technologies (ICT), and the result was the rapid development of the Internet. In this way, in the era of dynamic and sudden growth of different, above all electronic media, which cover, at any time, practically all parts of the planet, the importance of the Internet is increasing, and young people are starting to use it earlier and with a longer number of hours. Not only in the process of education, but the Internet as a global medium creates the attitudes and opinions of all layers of society.

By working on a computer and using the Internet, young people learn in a fun and interesting way how to use modern technology, which will certainly benefit them in their studies and leisure activities. On the other hand, an increasing number of different human activities are connected to the Internet (education, science, culture, trade and entertainment), so it goes without saying that the Internet is an increasingly present and influential factor in the work and life of many individuals, social groups and communities. The Internet is the main mass media today. Therefore, its role in upbringing and education is very significant. The Internet, as one of the virtual institutions, is a dominant medium for communication, education and business (Bubaš, 2000, p. 14). The Internet brings the virtual world closer, which represents a great provocation for the educational process because it is, over time, more and more attractive and challenging than the classic educational system. Individuals are increasingly trying to distance themselves from the daily pattern of living and the conditions of mass communication. From that aspect, the Internet affects beliefs, attitudes, social norms and universal cultural values and patterns in all directions (directly and indirectly). The Internet especially has a great influence on young people, that is, on their functional

upbringing and education, as one of the most important factors. After the initial difficult and unreliable steps, distance learning (DL) has crossed international borders and Serbia is already entering the international market of electronic learning. The USA is a competitive market in electronic learning and education (the experience that America, Canada and Australia have in this domain dates back to the eighties of the nineteenth century). In modern conditions, electronic learning is quite a common phenomenon even at the most famous faculties (Harvard, Stanford, MIT), which offer a wide selection of the most diverse accredited academic courses in their virtual classrooms. The electronic form of distance learning has replaced paper forms with a new name - electronic learning (e-Learning). All educational material, in this form, is sent to users in electronic form, which is why e-mail, FTP protocol (File Transfer Protocol), and HTTP protocol (Hypertext Transfer Protocol) are used. Also, the user returns all completed tests to the educational institution by e-mail or does it using a specialized Web site - portal, which records the student's answers in the database. Mobile learning (m-learning) is electronic learning in which access to learning materials is made possible through the effective use of personal digital assistants (PDAs), mobile phones, smartphones and tablets.

Typically, e-learning is described as learning "anytime, anywhere", but with access to a computer and an Internet connection. Mobile learning doesn't need those connections. All the student needs is a PDA or mobile phone and a wireless network (Vrhovac et al., 2017). Information technologies are introduced into the curricula of higher education institutions. The College of Vocational Studies for Information Technologies was founded in 2006 in Belgrade, and since 2017, in addition to the basic vocational studies, accredited vocational master's studies have been introduced, which train professional information technology engineers. In this context, it can be stated that information technologies have developed into a special scientific discipline. Defining the concept of information technology is not simple, because it is believed that there is no universal definition of information technology. For example, information technology is defined as a scientific discipline that deals with the study of systemic approaches in the selection, development, application, integration and administration of secure computer technologies - which should enable users to achieve personal, organizational and social goals (Pokorni, Kuleto and Radić, 2018). However, almost ten years earlier, information technologies were defined so that in the broadest sense they encompass all aspects of computer technologies, i.e. IT, as a scientific discipline, deals with problems related to the representation and satisfaction of user needs within the organizational and social environment, through choice, creation, application, integration and administration of computer technologies (Lunt et al., 2008). The aforementioned definitions indicate that information technologies are largely oriented towards meeting the needs of users and that more and more attention is being paid to problems related to security at all levels of the economy and society.

Interdependence of ICT and management in the education process

In the modern conditions of living and doing business, the interdependence of ICT and the study of management as a scientific and business discipline is increasingly close because dynamic technical-technological development directly imposes numerous changes that are increasingly present in every sphere. Continuity in the development and raising of the level of application of information technologies directly influenced the improvement of the level of education, exchange of information, and especially the level of performance in the business and production functions of the company. The most important component is computers and computer equipment. The use of computers makes it possible to exchange various information and data very quickly, easily, efficiently and cheaply, not only in the field of business but also in education in the field of management. It is especially important that it enables effective conversation in an internal and external environment. Acquiring and raising the level of knowledge via the Internet, as an important means and method of knowledge distribution, has a number of advantages, which can be (Bubaš, 2000): fast distribution - participants access the offered material via the WWW, it is possible to include hypermedia materials, the service can be used simultaneously by individuals and groups, the possibility of connecting "linking", multimedia content. Information technologies in an indirect way - through information systems, have a significant impact on the efficiency of company management. However, if the information system is fast, reliable and comprehensive in the sense that it ensures the timely creation of reports on the company's performance, the management will have a good information basis for management, that is, the process of managing the company will be more efficient. Through it, companies carry out daily operations smoothly, and at the same time provide support in making business decisions through advanced reporting. The components of the information system consist of information technologies (hardware, software, data and communications), people and processes. The software contains a set of business rules and important formalized knowledge about the performance of business

processes, and in interaction with it, employees perform their work tasks (Vesić, 2022).

Information systems that companies use to increase business efficiency are usually classified into the following types according to their purpose (Jovičić, Đokić and Stanić, 2018):

- (1) MIS (Management Information System) for management support based on the automation of report creation,
- (2) DSS (Decision Support Systems) for decision support,
- (3) TPS (Transaction Processing Systems) to support the transaction processing process,
- (4) KMS (Knowledge Management Systems) to support knowledge management and
- (5) Information system for office automation - OAS (An office automation system)

Since the beginning of the twenty-first century in Serbia, there has been a sudden increase in the interest of young people in various study programs in the field of information technology. In addition, higher education institutions or faculties are increasing their activity in this domain. On the one hand, the increased motivation of students for ICT studies in Serbia is a positive consequence of two main factors:

- (1) the technology sector is one of the few in Serbia with a labour shortage, and
- (2) the average salary of employees in the technology sector is significantly (four to seven times) higher than the Serbian average

On the other hand, in developed countries, students' interest in the ICT sector is declining because salaries in that sector are more dependent on international competition compared to salaries in other sectors. On the other hand, it should be borne in mind that the domestic IT market is shallow and that the companies operating in this area are focused on the global market. These are mostly large companies because individuals do not have the financial potential needed to operate on the global market. In recent years, there has been a trend for global tech companies to relocate resources and production from developed to less developed countries. However, relocation did not occur in all branches. On the one hand, the production of security-sensitive highly profitable products such as rocket systems and technologies related to space exploration has not been displaced because it is prohibited by law. On the other hand, the production of financial applications (for banking), trade applications (internet trade) and payment applications (money transfer) are, as a rule, relocated to less developed countries (Jovičić, Đokić and Stamatović, 2018).

The main goal of ICT studies is to provide students with a high-quality education so that after completing their studies, they have the knowledge and skills needed to work in appropriate positions in the field of information technology. In addition, students should be able to continue their education - master and doctoral studies in this field. In general, IT education should be aimed at acquiring the ability of a modern approach to solving problems, where the use of technology that enables different methods and ways of working is assumed. It is predicted that as early as 2027, Serbia will enter a serious labour market crisis, which would be reflected in the lack of manpower needed for continued economic growth. In addition, if the existing economic structure were to be maintained, due to higher demand compared to labour supply, the growth of wages would be higher than the growth of inflation, which would have a negative impact on the level of competitiveness of the Serbian economy and the general slowdown of economic activity (Petrović, 2019, pp. 32-38).

In front of managers and innovators, society puts the demand on the knowledge economy. In such an economy, a large part of employees is no longer involved in the physical production and distribution of material goods, but in their design, then in development, in technologies, marketing, effective sales and maintenance. Under these conditions, companies are directed towards the creation of special systems and procedures aimed at acquiring, memorizing, disseminating and using organizational knowledge (Lutovac, 2012, p. 182). Modern networking technologies increase the possibility of communication and provide unlimited access to information. On the other hand, networking technology has become an essential pedagogical tool in most higher education (academic) programs. These changes are considered to fall into two categories - technological and pedagogical - each of which has a significant impact on the education of IT professionals (Lunt et al., 2008). However, when developing an information technology curriculum, it is important to include all changes in technology. In addition, the approach to teaching is also changing, as the focus shifts to the student, learning outcomes and appropriate competencies. To achieve quality in the education of young IT experts and operatives, a number of factors that influence the success of the planned training programs should be taken into account. Many of success factors are divided into several broad categories, indicating the degree to which favourable conditions need to be created or improved. Special attention in this entire process is paid to the level of quality of the educational program, i.e. modules, and the level of quality of educators. Certainly, it is the most sensitive point in the

entire program or approach, because it can contain a number of subjective assessments and attitudes. The quality of the manager's entrepreneurial spirit and leadership abilities depends on the quality of his education. Conversely, the charge of positive energy of a leader in the phase of organization creation also requires special personality qualities, the ability to adapt in turbulent circumstances, to solve problems on the fly, to accept change as a challenge and to be able to create a climate of trust in the fluid unstructured environment of the organization, a common goal and a special mission, which means the readiness of employees to solve all problems as a team in conditions of rapid and sudden changes (Petrović, Pavlović and Vujić, 2018).

On the other hand, technology also affects the nature of pedagogy. This implies a transition from the previously known so-called didactic triangle (pupil-student, teaching content, teacher), to the didactic quadrilateral, where teaching technology is added to the previous triangle - which changes over time, and today it is dominated by computers, software, the Internet and networking. In this sense, demonstration software, computer projections and individual laboratory stations significantly improved the way of learning by using new information technologies.

New multidisciplinary subjects/modules

In the modern structure of an ICT company, which is engaged in the production of applications, from the aspect of the type of work performed in it, in the broadest sense, three large groups of work can be distinguished: programmers, analysts and DevOps.

The first group of employees deals with coding, which used to be called programming and more recently is called development. Employees in this group/sector are mostly students of the Faculty of Mathematics, Electrical Engineering and Organizational Sciences. Former programmers are now more often referred to as developers.

Another group of employees are analysts who interpret client requirements, specify the tasks of programmers and test the produced applications. This group does not program but provides a connection between the requests of clients - users of applications (for example, to create a banking application for managing client's accounts) and programmers in an IT company who produce (code) the requested application. Employees in this sector usually come from the Faculty of Economics and the Faculty of Organizational Sciences and are engaged in one of the following activities: business analyst (BA), quality assurance (QA), project manager (PM), and product manager (Product Manager).

The third group of employees are DevOpses who deal with providing technical prerequisites for business, building and long-term configuration of the necessary IT infrastructure. Their role is to speed up the process of development, testing and release of software into production as much as possible, through different ways of automation and the use of specialized software tools. In this way, they enable the ICT company to meet the needs of clients in the shortest possible time, reducing the time of the software development life cycle. In addition to classic system administrators, this includes those who maintain virtual machines (VM) and configure cloud services, maintain connectivity (internal networks, Internet connections with the outside world) and the availability of databases and data warehouses.

With the aim of increasing the efficiency of teaching, it is desirable to structure teaching modules so that each module deals with topics/material that corresponds to the requirements of individual jobs that appear in modern IT companies. Bearing in mind the identified roles in the IT company, the effort is to create teaching modules that correspond to the modern needs of the global market. On the one hand, the mentioned roles (BA, QA) require knowledge that cannot be obtained by a single faculty in the current system of higher education. On the other hand, the existing deviation between the requirements of a job in an IT company and the school program of individual faculties can be effectively overcome by introducing new teaching units (courses/subjects) that would provide the required, multidisciplinary knowledge. This suggests that, in a practical sense, it is necessary to create several new subjects that would provide knowledge that is required for certain workplaces in IT companies, and which, according to the current system, are acquired at several different faculties. At the same time, there is also the phenomenon that certain knowledge is available within one, or even in a larger number of subjects, but they are not structurally organized into one coherent whole, so it is not possible to achieve sufficient benefit from them in modern business and modern practices of software development.

It is proposed to create the following five thematic units or subjects: business analysis, quality assurance, IT project management, IT product management, and DevOps:

(1) Business analysis is a module/subject that should provide the knowledge and skills required for the position of business analyst in an IT company (BA). Its main role is to define business requirements in communication with clients. A business analyst should, in addition to the domain knowledge (e.g. finance)

acquired at the Faculty of Economics, also possess technical skills, e.g. to search databases (via basic SQL queries) that are studied more at the Faculty of Organizational Sciences, and less at the home Faculty of Economics as well as at complementary faculties and study programs. This module would provide basic knowledge related to databases. In addition, students would learn business specification writing techniques, which are an integral part of the analyst's job. Finally, the material would cover the creation of test plans for the needs of testing new code, which is an indispensable job of every analyst. In this way, it is ensured that the software product implements the agreed business scenarios.

(2) Quality Assurance (QA) is a module/subject that should provide knowledge and skills related to automatic or manual testing - performed on a daily basis in order to improve the quality of new code/application. In this course, students would learn the theory of testing and gain practical skills in using several standard automated testing tools, such as QTP and Selenium.

(3) Project management is a module/subject that should provide the knowledge and skills needed for the position of Project Manager (PM) in IT companies. This subject should not be confused with existing project management, because this is a subspecialization related to IT project management, in the sense of creating, testing and implementing a new application that an IT company makes for its client. Students would gain knowledge about the basic phases of an IT project, the connection between those phases and the standard problems accompanying the implementation of IT applications, such as the lack of interest of the client in the initial phase, expected delays and potential additions and changes to the original requirements during implementation.

(4) Product management is a module/subject that should provide the knowledge and skills needed for the position of product manager (Product Manager or Product Owner). Students would master the agile methodology for developing new and supporting existing products and precisely understand the roles each participant (developer, BA, QA) has in daily operational work.

(5) DevOps is a module/subject that should provide knowledge and skills that are needed in the workplace in the DevOps sector of an IT company. Students would be able to conceptually understand the various technical prerequisites and practices required to create and manage a complex IT infrastructure, which may include networking, cloud computing, operating systems, code versioning software, security, testing, etc.

The proposal for the creation of new teaching units aims to fill the current gap, i.e. remove the problem of IT companies related to the introduction of trainees. Introducing interns to work is quite difficult due to the fact that the workplace requires multidisciplinary knowledge that, according to the current curriculum, is acquired at several different faculties. In practice, it takes several years for a beginner to understand the day-to-day business activities in an IT company, and the new modules would reduce this adjustment time from several years to a few weeks.

In the described way, the possibility would also be created for young people to be more effectively educated for work in modern IT companies that nurture agile development practices, such as example, Scrum, which by its very nature requires more IT specialists, compared to public companies and large state systems, which generally do not have such practices, and because of the staff deficit, they tend more to be IT generalists.

Conclusion

Information technologies differ from other computer disciplines in terms of applicability. Unlike other computer disciplines, which are largely theoretical and insufficiently applicable, information technologies are more applied, i.e. focused on system infrastructure and the full application of technology. Demands for connection to a fully networked service, anytime, anywhere, in recent years have led to a growth in the number of wireless networks, similar to the rapid growth in the number of Internet users in the last decade of the twentieth century.

They are experiencing a special, dynamic expansion of information technology thanks to the so-called start-up companies. In the development of education, education and science, and from the aspect of various education modalities, Serbia strives to introduce international standards. In essence, the development of economic and non-economic activities, i.e. society as a whole, depends a lot on these efforts. Certainly, interdependence and openness towards world trends, in the areas of the social superstructure, require strategic determinants, that is, the existence of clear national goals and values.

Keeping that broader aspect in mind, the ICT sector is important for the development of the economy and society, both in the domain of higher education and in the domain of fast-growing start-up companies. An effective concept of education for ICT experts is especially required to know the technological and pedagogical level and predispositions. In connection with technological changes, effective networking is

emphasized.

In the effective application of ICT technology in the education of managers, the most important thing is to adapt to dynamic changes in the environment. Therefore, the primary task of educators is to determine not only positive but also negative influences and to adequately treat them in models of the educational process. The process of education of modern managers, in modern crises and turbulent conditions, will increasingly depend on the way and extent of using information and communication technologies.

Conflict of interests

The authors declare no conflict of interest.

Author Contributions

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