

Implementing Information and Communication Technologies in Educating Knowledge Workers

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Abstract. The possession and access to relevant information, as well as to the newly created knowledge, became the main asset within knowledge-based economies, and, hence, societies. In order to achieve considerable level of innovation and competitiveness in the modern labor market, companies are striving to manage knowledge they dispose with in the most optimal way. One of the basic preconditions for accomplishing this goal is to employ highly skilled knowledge workers. Given that this is the workforce of the future, all levels of education, particularly institutions at the university level, must adapt their curricula in order to form professionals capable of anticipating and solving problems within the business environment. Considering that these professionals must remain experts in their scientific fields during their entire career, the concept of lifelong learning especially applies to them. Hence, universities must pay particular attention not only to educating future knowledge workers, but also to providing constant additional training, primarily through digital means and distance type of learning.

Knowledge workers are encouraged to use digital tools and methods as much as possible for the purpose of their professional development. In order to achieve and maintain a high level of competitiveness in the ever-changing labor market, these experts are also required to stay constantly and adequately informed, which they mostly accomplish by means of digital media. Therefore, it became obvious that when educating future knowledge workers universities have to implement ICT to a much greater extent. Digital tools should also be utilized at the university level in order to incite a higher level of creativity of university students, as this is one of the essential features of knowledge professionals. Encouraging inventiveness at the university level is particularly important so that future knowledge workers can acquire the habit of transferring theoretical knowledge in an original manner into new applicable knowledge. Within this paper, we will offer a review of current knowledge workers' education at the university level and possible innovations in this regard, particularly with the application of digital tools in lifelong education and training of future workforce based on knowledge.

Keywords. ICT, education, knowledge workers, knowledge-based economies, innovation and competitiveness, modern labor market, curricula, lifelong learning, digital tools and methods, professional development, workforce based on knowledge

1. Introduction

The possession and access to relevant information, their purposeful use and the creation of new knowledge, became main assets within knowledge-based economies, i.e. societies. Companies worldwide strive to manage knowledge they possess in the most optimal manner in order to achieve considerable level of innovation and competitiveness in the modern labor market. One of the basic preconditions for accomplishing this goal is to employ highly skilled knowledge workers. These experts represent the workforce of the future, as they are not only capable of solving problems, but of anticipating them and offering best solutions in this regard. Accordingly, institutions at all levels of education, particularly universities, must adapt their curricula as to educate professionals capable of adapting to the ever-changing and increasingly demanding business environment. Moreover, the concept of lifelong learning especially applies to knowledge workers, as they must remain experts in the field of their expertise throughout their working lives. Hence, universities must pay particular attention not only to educating future knowledge workers, but also to providing constant additional training, primarily by means of digital technologies and distance type of learning. We would like to emphasize the role and importance of implementing modern information and communication technologies when educating future knowledge workers at the university level, but also accentuate the necessity of continuous learning upon completion of formal studies.

2. Defining Knowledge and Knowledge-Based Economies

Experts in the field of knowledge management continue to struggle to give a precise definition of the knowledge as to advance the understanding of what knowledge management represents and how it will affect the working environment in the future. These definitions largely depend on whether they treat knowledge in organizational settings as something that people possess or as something that people do. Accordingly, in the study *Bridging epistemologies: The generative dance between organizational knowledge and organizational knowing*¹, Cook and Brown (1999) differentiated *the epistemology of possession* and *the epistemology of practice*. If we are to understand the knowledge as something that we possess and implement in our work, than the definition given by Newell, Robertson, Scarbrough and Swan (2009) in *Managing knowledge work and innovation*, seems appropriate, as they treat the knowledge “as a mental (or cognitive) capacity, or resource, that can be developed, applied and used to improve effectiveness in the workplace”². Furthermore, scholars in the knowledge management field concluded that there are at least two diverse types of knowledge: explicit and tacit. Within *Key issues in knowledge management*, Firestone noted that explicit knowledge represents the one that can be codified,

¹ Cook, S. D., & Brown, J. S., (1999). Bridging epistemologies: The generative dance between organizational knowledge and organizational knowing. *Organization science*, 10(4), 381-400.

² Newell, S., Robertson, M., Scarbrough, H., & Swan, J., (2009). *Managing knowledge work and innovation*. Palgrave Macmillan. p. 3.

captured and communicated (2001)³. On the other hand, tacit knowledge includes the know-how component and experiences, conditioned by values, intuition, emotions, and similar. Tacit knowledge is to the same extent or even more required in organizational settings than explicit knowledge. This applies in particular to knowledge-intensive firms where tacit knowledge is highly regarded, such as consulting companies, whose main aim is to transfer the Know How component to its customers. In societies that strive towards the economy based on knowledge, both explicit and tacit types of knowledge will have to be incorporated in educational programs at all levels of education.

Many would argue that we have already surpassed the information age and that we now live in the knowledge era. Moreover, with the appearance and use of the Internet and World Wide Web, an immense number of information literally overburdened the mankind, which almost led towards the oversaturation with information of Internet users. Nowadays, when possession and handling of information is not enough anymore, the creation of new knowledge based on available information becomes essential. This stems from the fact that although knowledge is based on information, it goes well beyond it, i.e. knowledge represents a set of related information to which people attribute certain meaning. As the industrial economy slowly remains in the past, the importance of information, research and services grows substantially and becomes more important than manufacturing. Post-industrial economies are nowadays leaning towards the economy based on knowledge, the one that implies “production and services based on knowledge-intensive activities that contribute to an accelerated pace of technological and scientific advance as well as equally rapid obsolescence. The key components of a knowledge economy include a greater reliance on intellectual capabilities than on physical inputs or natural resources, combined with efforts to integrate improvements in every stage of the production process”⁴. Newly created knowledge economies will greatly affect the labor market in the future, as the number of required qualifications, knowledge and skills will increase tremendously and the demand for workers who previously acquired the necessary skills and knowledge will get even higher.

3. The Workforce of the Future – Knowledge Workers

Increased use of ICT in all spheres of human life, but particularly its implementation in working environment, made an immense impact upon the structure of the workforce. Namely, as the world becomes progressively connected by means of digital tools and technologies, the workforce had to change, i.e. evolve. One of the main features of such workforce is its mobility,

³ Firestone, J. M., (2001). Key issues in knowledge management. *Journal of knowledge management consortium international*, 1(3). *Knowledge and Innovation: Journal of the KMCI*, 1(3)

⁴ Powell, W. W., & Snellman, K., (2004). The knowledge economy. *Annual Review of Sociology*. p. 199.

as many workers can nowadays work anytime and anywhere, provided they have an appropriate Internet connection. It seems that this tendency will gain momentum even more in the future. The growing number of freelancers worldwide testifies clearly in favor of this statement. In addition to this, modern workers have to be highly flexible and able to learn quickly, as jobs for life no longer exist. Their communication skills will have to be at a much higher level than was previously the case, as they will need to communicate not only within their teams, but also with the wider community, with whom they can get or stay in contact through modern information technologies and digital tools. Considering that the number of skills required in the labor market is rising more than ever before, the modern worker will have to master, as well as continuously improve, the aforementioned skills in order to become or stay employable.

Furthermore, as information and communication technologies permeate the entire business environment, technology skills have become indispensable and highly regarded within a modern labor market. This puts special emphasis on educational institutions to introduce ICTs to a much greater extent in their curricula as to instruct their students on how to optimally use digital technologies in the future. It appears that a considerable number of students will become knowledge workers in a relatively near future and will be required to use modern technologies during their entire careers, hence curricula at all levels of education must be aligned with these new tendencies. Moreover, as a result of these changes, which should be introduced in the curricula of primary, secondary, but particularly higher education institutions, there will be an increasing number of knowledge workers in general. This will have a particularly beneficial impact on the countries that are committed to the goal of creating economies primarily or mostly based on knowledge.

4. Educating Knowledge Workers for the Modern Labor Market

Peter Drucker initially introduced term knowledge worker in 1959 within his renewed work *Landmarks of Tomorrow*⁵, where he argued that educated people would become the main productive resource in the modern society. In his later work *The Age of Social Transformation*, Drucker emphasized that “knowledge workers will not be the majority in the knowledge society, but in many if not most developed societies they will be the largest single population and work-force group. And even where outnumbered by other groups, knowledge workers will give the emerging knowledge society its character, its leadership, its social profile.”⁶ In order to form such a group of professionals, educational institutions need to make changes in their curricula, and this primarily refers to increasing

⁵Drucker, P., (1959). *Landmarks of Tomorrow: A Report on the New “Post-Modern” World*.

⁶Drucker, P., (1994). *The Age of Social Transformation*. *Atlantic Monthly*. Available at: <http://www.theatlantic.com/past/docs/issues/95dec/chilearn/drucker.htm#>, accessed in: 15/04/2015.

the use of ICTs in educational process, i.e. its implementation in both teaching and learning activities. Upon completing the highest level of formal education, knowledge workers only become experts in a particular field once they combine the practical experience they gained within a working environment and the theoretical knowledge they acquired at the higher education institution. This requires a greater connection between higher education institutions and industry or private sector. Faculties should organize, in cooperation with enterprises, mandatory practices for students as an integral part of their studies, so that they could gain more practical experience in working, amongst other things, with modern digital technologies they are required to use in their future work. In addition to this, knowledge workers must continuously improve the knowledge and skills they possess in their field of expertise. Hence, universities should create courses that aim at providing lifelong learning to knowledge workers, which can be made available in distance learning format through diverse modern ICTs. Nowadays, many companies employ almost exclusively knowledge workers. These are knowledge-intensive firms, which mostly provide high quality consultancy services, but also include accounting practices, investment banks, law firms, public relations agencies, and many others. Knowledge-intensive firms strive to employ best experts in a given field as to be able to guarantee and maintain a high level of services they offer to their clients. In order to educate a sufficient number of these experts, universities must modernize their programmes by introducing ICTs to a much greater level within the educational process.

5. Information Society and the Role of ICTs in Educating Knowledge Workers

The information society, which arrived just after the postindustrial, became global with the use of the Internet and World Wide Web. As a result, an unlimited number of options and possibilities in terms of communication and cooperation between the worldwide community of Web users was made available and numerous systems of organized and adequately presented information, offering tremendous intellectual input and output, were created. Main symbols of the modern age became: up-to-date and quick information, implicit as well as explicit knowledge, creativity, competition, multidisciplinary, collaboration, flexibility, minimization of mistakes, compression and visualization of the great number of facts, etc. These characteristics of modern information society imply the application of new technologies to a much greater extent in all spheres of our lives, but particularly within a working environment where it became indispensable to use modern ICTs in all the processes. Knowledge era will put even more requirements in front of the working man, from whom it is nowadays expected to be e-literate, proficient in the implementation of digital technologies and have high level of communication, teamwork and problem solving skills. This especially refers to knowledge workers, as they will need to attain digital proficiency and all the other ICT related skills in order to be able to perform highly difficult tasks that are expected of them.

Knowledge workers are nowadays encouraged to use digital tools and methods as much as possible for the purpose of their professional development, hence digital competencies became indispensable for this type of professionals. Moreover, in order to achieve and maintain a high level of competitiveness in the ever-changing labor market, these experts are also required to stay constantly and adequately informed, which they mostly accomplish by means of digital tools and media. It became obvious that when educating future knowledge workers universities have to implement ICTs to a much greater level. Digital tools should also be utilized at the university level in order to incite a higher level of creativity of university students, as this represents one of the main features of knowledge professionals. Encouraging inventiveness at the university level is particularly important so that future knowledge workers can acquire the habit of transferring theoretical knowledge in an original manner into the new applicable knowledge. Innovation based on knowledge is one of the most sought-after skill of knowledge workers, considering that it is only by introducing innovations that companies become visible in a global market and their services accessible to a large number of users. Current knowledge workers' education at the university level has already introduced certain modifications that aim to answer the needs and demands of the modern labor market. This particularly refers to the greater application of digital tools in the framework of higher education institutions, as well as in lifelong learning programs and training of future knowledge workers. However, universities will have to continue to modernize their curricula and innovate even more in the future in order to keep up the pace with the accelerated development of digital technologies.

6. Implementing ICTs in Educational Programs of Future Knowledge Workers

The increased implementation of ICTs in education area resulted in the emergence of open online types of learning that support distance and blended learning, through the Internet and via virtual learning environments, such as Moodle, as well as facilitate lifelong learning. Thus, the acquisition of new knowledge is made possible in e-supported learning format as well, both in formal and informal type of education. In order to meet the requirements of technology supported learning, which may be partially or fully implemented, professors have to acquire thorough understanding of ICTs and use them in a creative manner in the process of teaching. This also implies that they should frequently update their skills and knowledge in the field of information and communication technologies, which means that they will have to be continuously educated in this regard throughout their entire academic careers. These new types of teaching and learning will connect educational and research institutions with the private sector to a much greater extent (for example students can attend online seminars held by various enterprises by means of virtual classrooms). E-supported education can produce highly employable professionals, who could then become the backbone of knowledge economies in their own countries.

We believe that the optimal way of implementing ICTs in educational programs of knowledge workers would be to reconcile the traditional, formal, face-to-face model of education and modern, multi-media Internet-based type of learning. Blended learning represents the best example of combining traditional and modern way of teaching and learning, as its “basic principle is that face-to-face oral communication and online written communication are optimally integrated such that the strengths of each are blended into a unique learning experience congruent with the context and intended educational purpose.”⁷ This also implies the existence of adequate combination of synchronous and asynchronous type of learning activities, which can be easily organized and implemented via modern digital technologies, in addition to teaching presence. One of the main advantages of this at least partial e-learning approach is that it “can encourage participants to make *better* use of face-to-face contact in the knowledge that preparations and follow up can be conducted online.”⁸ Moreover, this type of learning can enable the development of students’ ability of critical thinking, and, thus, create intellectual elite who shall be able to re-examine traditional values of postindustrial society. Taking into consideration that the knowledge era has already began and that it has put the extensive emphasis on education and human capital as drivers of economic progress, members of this elite will primarily include knowledge workers.

7. Modernizing Curricula at the Faculty of Philology in Belgrade

The Faculty of Philology of the University of Belgrade has recognized the need and importance of designing interdisciplinary and multidisciplinary educational programs that could support information, communication and media education and literacy. This particularly refers to enriching the courses offered at the Library and Information Science Department. The Faculty wanted to align its curricula with the objectives set out in the *Strategy for the Development of Education in Serbia 2020* and the *Strategy for the Development of Information Society in Serbia until 2020*, and hence, it began preparations for curriculum reforms at all levels of studies. In addition to developing multilingualism, our newly created curricula strive at achieving: the acquisition of interdisciplinary and multidisciplinary professional competencies, problem-solving skills, basic understanding of programming and web administration, project management, teamwork, media and information literacy, digital culture, editorial and ethical competencies, as well as many other skills and competencies. The Faculty of Philology was guided by the necessity to respond to the challenges of the Knowledge Era and the demand for knowledge workers on the Serbian labor market, taking into account an increasing number of knowledge-intensive firms in Serbia that employ mostly knowledge workers. We will continue to strive to modify our curricula in order to establish a sustainable model of cooperation

⁷ Garrison, D. R., & Vaughan, N. D., (2008). Blended learning in higher education: Framework, principles, and guidelines. John Wiley & Sons. p. 5.

⁸ Mason, R., & Rennie, F., (2006). E-learning: the key concepts. Routledge. p.32.

between our faculty, industry and the public sector as to ensure and improve the quality of students' competencies aligned with the demand on the modern labor market. We will adopt and apply European experiences and expertise in the field of digital culture, information, communication and media literacy even more in the future, as well as cooperate with the industry in the area of training, practice and employment to a much greater extent.

8. Educating Future Knowledge Workers by Introducing ICTs via Blended Learning

The increasing use of ICTs for educational purposes in the 21st century had a tremendous impact on modifying higher education institutions' curricula worldwide. New "forms of communication and our ability to manage information challenge our cognitive abilities and the traditional classroom paradigm. Institutions of higher education need to discover their transformative potential."⁹ The Faculty of Philology in Belgrade opted for blended type of learning in order to modernize its curricula, as "an approach to educational redesign that can enhance and extend learning and offer designs that efficiently manage large courses."¹⁰ We were guided by the idea that a blended way of learning represents more acceptable form of e-learning than distance learning when introducing online learning at the higher education level. We decided for this type of knowledge transfer, considering that distance learning abolishes completely presence of professors and taking into account our firm belief that teachers represent a priceless component of the educational process, as they are the ones that direct students as to achieve the best possible results during their unique process of acquiring knowledge. On the other hand, compared with the traditional way of organizing teaching, blended learning can provide better opportunities for achieving meaningful learning. This could lead towards creating a network of experts whose future work will be, entirely or partially, based on the transmission and creation of new knowledge. Furthermore, it is precisely through the courses offered in blended learning format that we can create a community of learners or *community of inquiry* (Garrison, 2004), which can possibly become Serbian community of knowledge workers in the future, and, thus, provide the opportunity for our students to discuss the most relevant issues in their respective field of expertise and realize critical discourse within a community of inquiry via modern digital technologies. This is enabled throughout *virtual classrooms*, which represent a meeting place where students and instructors can work together on the content offered within a technology-based environment. We believe that our faculty offers its students, through blended learning type of courses, the right balance between face-to-face and Internet-based learning, taking place in virtual classrooms. The Faculty of

⁹ Garrison, D. R., & Kanuka, H., (2004). Blended learning: Uncovering its transformative potential in higher education. *The internet and higher education*, 7(2), p. 96.

¹⁰ Garrison, D. R., & Vaughan, N. D., (2008). Blended learning in higher education: Framework, principles, and guidelines. John Wiley & Sons. p.7.

Philology has created its virtual classrooms by means of the open-source e-learning Moodle platform.

From our experiences, which confirm the statements of blended learning advocates, in comparison to the traditional and distance learning, blended learning has combined the best components of these two ways of conveying knowledge: face-to-face lectures and the following advantage of e-learning: “the ability of asynchronous Internet communication technology to facilitate a simultaneous independent and collaborative learning experience.”¹¹ Moreover, these “asynchronous collaborative technologies enable ‘any-time, any-place’ collaboration providing freedom of time (so learners participate when and if they choose), opportunities to research and backup assertions, more time for reflection, more time to phrase the intervention.”¹² As Karen Swan noticed, in her paper dealing with the student satisfaction and perceived learning in asynchronous online courses¹³, blended learning owes its success mostly to the interactive capabilities of ICTs, which ensure the higher level of interactivity and involvement of students included in asynchronous format of learning and leads towards the higher rate of satisfaction amongst learners (Swan, 2001). Hence, we believe that our courses in blended format can greatly increase the success rate of our students in the future, as they can be better adapted to their needs than those who are primarily based on lectures, or face-to-face approach. We will achieve this by putting our students in the center of the didactic triangle, thus making them more active. This is greatly facilitated by the use of ICTs in teaching and learning process, i.e. in our case through the implementation of blended learning model to designing courses at all level of studies. At the same time, we will strive to enable a proportional distribution of independent type of learning and teaching presence, as we believe that the guidance by competent experts is nevertheless necessary in order to achieve high quality of acquired knowledge and possibly educate future knowledge workers who will be able to apply gained knowledge in the workplace as well as generate new ones.

9. Implementing ICTs through Blended Learning in the Language, Literature, Culture Study Program at the Faculty of Philology in Belgrade

The Faculty of Philology of the University of Belgrade, boasting a wide range of educational, cultural and scientific activities and offering the study of 34 languages, cultures and literatures, developed in blended learning format and

¹¹ Garrison, D. R., & Kanuka, H., (2004). Blended learning: Uncovering its transformative potential in higher education. *The internet and higher education*, 7(2), p. 97.

¹² Marjanovic, O., (1999). Learning and teaching in a synchronous collaborative environment. *Journal of Computer Assisted Learning*, 15(2). p.131.

¹³ Swan, K., (2001). Virtual interaction: Design factors affecting student satisfaction and perceived learning in asynchronous online courses. *Distance education*, 22(2), 306-331.

introduced, since 2010, a multilingual and multicultural *Language, Literature, Culture* study program at all levels of study. Striving to successfully implement blended type of learning for the purpose of LLC program, the Faculty uses open-source platform Moodle, as the e-learning environment where course materials are being stored, which are obligatory or optional for the successful completion of the course. The learning process of our students is greatly facilitated by introduction of ICTs in educational process, as virtual learning platform Moodle offers: better course organization, easier access to course information and materials, as well as knowledge sharing, considering that this e-learning system can be used for communication and interaction amongst course participants (whether there is an interaction between professors and students or between students themselves). The Faculty of Philology aims at encouraging students' active learning by not only providing full access to course material, but to additional learning tools as well. We are positive that these interactive tools, as facilitators of teaching and learning process, are adding value to traditional face-to-face type of lectures. They include forums, video links, audio recordings and many other technology-enhanced tools.

Through implementing blended type of learning within the *Language, Literature, Culture* study program via Moodle platform, the Faculty of Philology is convinced that it made the learning process more efficient and faster. This results from the following advantages enabled by introducing ICTs in educational process: constant availability of course information and materials, easy accessibility of wide range of media, as well as various resources and links facilitating teaching and learning process, possibility of posting tasks online at any time and place, opportunities for relatively easy editing, better interaction with professors and other course members and overall confidentiality of grades. Amongst the courses that are offered at all three level of studies within LLC study program, we will single out on this occasion those that are organized by the Library and Information Science Department of our faculty, considering that they aim to raise the level of information and media literacy of our students, as well as improve their knowledge and implementation of modern ICTs. These courses offer introduction and necessary knowledge in the area of library and information science and provide lectures on topics such as: Internet and web technologies, programming, and structure of information, databases and library information systems, multimedia documents, digital texts, and many others. In accordance with the requirements set out in the *Strategy for the Development of Information Society in Serbia until 2020*, as well as numerous initiatives and strategies aimed at raising the level of information and media literacy in the territory of Serbia, the Faculty of Philology designed these courses within its LLC study program in order to educate future experts in the field of library and information science that could possibly become future knowledge workers in these fields, as well as contribute to multidisciplinary of knowledge-intensive firms' teams consisted of highly educated and versatile knowledge workers.

10. Concluding Remarks

“Globalization and the ICT revolution combined are rapidly raising the demand for, and changing the nature of, education and skills.”¹⁴ Therefore, the necessity of adjusting educational programs with the changes imposed by the aforementioned arouse, particularly in the framework of higher education institutions. By implementing modern ICTs into the design of courses offered within the *Language, Literature, Culture* study program at all level of studies, the Faculty of Philology of the University of Belgrade aimed at educating future experts in the field of language, literature and culture, as well as in the field of information and communication technologies. We believe that we have thus greatly contributed to creating a future network of knowledge workers in Serbia in the aforementioned areas, as well as enriched the existing offer of high-quality professionals in the modern labor market of Serbia.

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¹⁴ Hanna, N. K., (2010). Transforming government and building the information society: Challenges and opportunities for the developing world. Springer Science & Business Media. p. 35.