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**Online educational environments and ICT tools in higher
education**

theses of doctoral dissertation

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The Importance and Actuality of the Topic

The importance of the Internet and digital tools in higher education is unquestionable at the beginning of the 21st century. The technological development of the globalized world is creating fast changes on this area, due to IT innovations the actors of the educational system have to face new challenges. With these changes new questions and problems are raised. How do technological opportunities and demands transform higher education and is it possible to use social network and web 2.0 applications in education? How and to what extent should digital tools be built into education? What new competences do teachers and students need to continue the digital development?

Higher education is trying to keep up with technological development by building new tools into its practice. This survey is exploring online environments of higher education, and attempting to unfold the opinions of professors and students about using new and popular digital opportunities in education for teaching and learning. Is it really possible to use these tools in education and will they help personal and collective learning? The research is also trying to find out how web 2.0 applications affect learning and if network based learning and e-learning are really efficient tools in higher education.

The Internet is an important place of social life, the number of users are increasing and web 2.0 programs are still very popular (Ujhelyi 2011). The technological revolution affects every part of life, and it also transforms the way we learn. The technological development have an influence on social progression by modifying and shaping everyday practices of communication, obtaining information, free time and learning as well (Sipos – Varga – Egervári, 2015). The spreading of the Internet and the popularity of web 2.0 applications together with the network based learning theories create the possibility of online and interactive courses (Forgó 2015). The online educational environment is a compound and holistic phrase that involves learning methods, technological tools and learning and pedagogical paradigms as well (Papp-Danka 2014).

Education's process of finding new ways and frames is relevant in the knowledge based society. As the social and economic environments are changing, cultural, motivational, communicational and social differences, attitudes and demands of students in higher education are getting more visible. Because of the technological innovations, changes are hard to follow and in the meantime theories in connection with learning and obtaining information are broadening. The fast development of IT in the previous decades has affected higher education and has deeply transformed the learning environment. This implies the presence of new possibilities and challenges and affects the spreading of e-learning in a positive way. „*E-learning is an educational activity, which uses electric technology or tools*” (Kovács 2011), including learning by computers or the opportunities of online educational network as well. According to the wildest theory e-learning is „*every act of learning that happens through the use of tools of information and communication.*” It helps the development of knowledge market by offering new and additional answers for demands in connection with training (Kovács 2011).

In Hungary neither the use of e-learning, nor building web 2.0 applications into classes have spread widely. Nowadays distance learning exists almost in all the developed countries. Distance learning has built Information and Communication Technology (ICT – *tools, technologies, organizing acts, innovative processes that help and develop the making, spreading, storing and encoding of information and communication*) (Magyar 2012) into its

methodology. With the spreading of the Internet e-learning can become popular as a new and effective educational form.

The results of the research help us to see the attitudes, habits and opinion of the actors in education. I think that the research about teachers is especially important. Within professional activity, competences of using digital tools and transmitting values have an important role. An important open question in higher education is how online educational environment will transform, will the use of e-learning materials be popular, and will institutional ICT factors be developed – including ICT competences of professors.

The dissertation attempts to give some answers on this research area. My main goal is to find out if there is a connection between age and the educational usage of online opportunities. The novelty of the dissertation is that the survey was made on a big pattern. By examining the actual situation, we will not only make a measurement, but also expand our knowledge about the opportunities and boundaries of using ICT in higher education. The study may help to map and understand the usage of digital tools and behavior in online environment of different generations in higher education. Therefore the research can be a help to higher education in finding its aims, regarding especially the development of curriculum supported by new technologies.

Bibliography and Previous Researches on the Topic

Previous studies in this topic have shown us that education should open up towards IT improvements. In recent years the European Union has been emphasizing the improvement of digital competences and the modernization of education and it has been trying to create a national framework that may help people to find the digital competences they need as European citizens (Ferrari 2013). There are many national and foreign studies dealing with higher education. These studies are trying to examine the situation of global and Hungarian online higher education and also trying to create some necessary changes. From national studies I would like to highlight the works of Bessenyei (2007, 2011), Kulcsár (2008,2009), Komenczi (2006,2009,2013) and Ollé (2010,2011).

The *'present forms of formal education can not be maintained and they are not effective and flexible enough'*, therefore they are not eligible for the demands of knowledge based society (Duga 2013). A new type of learning environment is needed to be formed and it is necessary to use educational methods such as *'collaborative learning, problem based teaching, project works and cooperative learning'*. In information society school is not the only place of learning and universities have to accept that the official curriculum is not the only source of information. In the new approach the role of teachers is changing, they are becoming mentors instead of mediators of information. The concept of connectivism - which is in the centre of the study – is coming from Siemens and Downes. Following their works (Siemens 2005, 2008 Downes 2010), other learning theories connected to connectivism have been defined as well (the work of Bessenyei-Szirkik from 2011 gives us an extensive review on the topic).

Connectivism is building on the results of network researches. In a review from Zsolt Kulcsár (2009): *'Connectivism means the application of network theories in pedagogy.'* According to this method web 2.0 tools must be used in teaching to reach a successful education. With the help of these tools, effective online learning systems can be created. Due to new technological inventions, users of the Internet are becoming suppliers instead of consumers. Applications make it easier for users and participants to share contents and they change the ways of sharing, creating and using photos, texts, videos, events and connections. Web 2.0 applications are building on communities, i.e. *„users create contents together or*

share each other's information" (Szűts 2014). Connectivist learning happens with the help of web 2.0 tools, i.e. every tool can be a specific inter-mediator of knowledge. They help to make information accessible and available for everyone. Some typical web 2.0 services are: „*social sites, sound, photo and video sharing pages, blogs, micro-blogs, forums, social bookmarkings, editable cyclopedias, virtual words, podcasts, live casting services.*” New applications give a chance to students to cooperate and share information, and increase their motivation, commitment and self-expression (Siemens 2010). A new expectation for professors is to share their knowledge more efficiently by actively using IT. Professors think that certain applications can be valuable in education, while their opinions on using social site sin learning are more problematic (Duga 2013).

In a study by Zoltán Szűts in 2014 he examines the roles of contents created by users and social sites in the interactive learning environment. „*By applying digital tools and world wide web into everyday life*”, the way of getting information and the mechanism of learning have both transformed. It has become a daily routine for university students to visit social sites, especially Facebook, which besides supplying information can also be an opportunity to create virtual learning groups. These groups usually deal with the implementing of courses and questions about bibliography, and sometimes professors can cooperate in them as well. Their main importance is in communication and cooperation between students. Due to technological development, the role of professors has changed, too. Instead of being the source of information, they rather function as moderators in the new environment (Szűts, 2014).

We can notice that in the process of getting information the role of the Internet is increasing, which is also a strong tendency in areas in connection with learning, the importance of e-curriculum and e-sources is increasing. We can also state that a great number of users can not or can only use the opportunities of the Internet very poorly, regarding especially the reliability and validity of information, and there is some uncertainty in data protection, etiquette and digital competences as well (Sipos et al. 2015).

Bertalan Komenczi (2013) in his work, *Electronic learning environments* examined the opportunities of network learning and the Internet. During online learning, students connect to the curriculum interactively and individually, therefore teaching does not exist anymore. „*Electronic info-communication technology is widening the possibilities of personal and sovereign learning*”, so contents can be reached in different modules, in database and according to personal demands. According to the author this way of learning „*best integrates informal and spontaneous learning into the process of gaining knowledge*” (Komenczi, 2013).

Courses building on network learning have a wide range of tools. For this I have used – among others – the works of Redecker, Ala-Mutka, Bacigalupo, Ferrari and Punie. Tom Franklin and Mark van Harmelen introduces how to apply web 2.0 tools into higher education with the examples of four universities.

A big difference of thinking can be seen between students and professors, which creates a barrier in successful teaching (Ollé 2012). The learning habits of Internet generation are affected by the fact that they spend more and more time using web 2.0 applications therefore creating a unique - and still unutilized – opportunity for higher education. Nowadays existing educational systems work less efficiently with the new generation, in higher education „*students mostly from generations Y and Z have different characteristics, therefore they need a different kind of education as well*” (Pais 2013).

Those youngsters who were born into digital technology are now members of higher education, for them online world belongs to everyday life. Applying web 2.0 applications into education could increase their motivation, commitment, expressing opinions and could encourage dialogue.

Generation research uses grouping by year of birth. International studies use the term digital natives for the generation who grew up with the Internet based on Digital natives, digital immigrants (2001) by Mark Prensky. But what do we mean by the term generation? *Those belong to the same generation* (McCrindle and Wolfinger 2010, quoted by Pál) *who were born in the same period of time, they are the same age and in the same period of life and therefore they have been affected by the same technology and experiences* (Pál 2013:5). *Certain generations have different life orientation, they have similar beliefs and behaviors regarding family, career, religion or politics* (Howe and Strauss 2000, quoted by Pál 2013). Generational approach is often accused of not consisting of unified and homogenous groups but of pseudo-communities. It is important that there are overlaps between generations, the borderlines are not clear, so grouping can be problematic. There are different theories and ideas if it is possible to call a group of people born in the same time a generation, and if it is, how can they be put into groups (Z. Karvalics 2001). The generation picture introduced (or rather created) by Prensky is often criticized, because it is not technology that determines the usage of media and habits of communication among youngsters, but the socio-cultural factors which have been forming the usage of digital technologies ever since (Szijártó 2013).

The Structure of the Research, Assumptions

The basic question of my research is how age (and therefore generational differences) affect the use of Internet and the opinions about learning environment and ICT among teachers and students. Based on the bibliography several differences can be found on different areas.

In my dissertation I introduce the results of four surveys. All four surveys were online. There are many reasons why I had chosen the method of online surveys. Most of my research questions could be asked through this method and it was also important to have a big pattern to get relevant information.

In my opinion with these results we are able to see a recent and realistic picture about the questions though it is not entirely representative. It gives us an extensive look on the current situation of online educational environment and it is also trying to answer some factual questions about a given institution (University of Pécs).

Before starting the survey I had made up my assumptions based on the bibliography and other similar researches.

In case of students the survey focuses on the following basic differences:

Hypothesis 1: Generational differences can be found in the usage of the Internet.

Hypothesis 2: There are differences between the generations of students regarding communication: in the frequency, intensity of communication and preferences in tools.

Hypothesis 3: Age differences can be found in the use and judgement of social sites, younger students use them.

Hypothesis 4: It is more appealing to younger students to use online tools and applications in education, younger students prefer educational opportunities of web 2.0 services.

Hypothesis 5: In higher education younger students are more open to new forms of getting information, more of them prefer new types of educational opportunities than older students.

In case of professors the research examines the following assumptions:

Hypothesis 6: Younger professors use web 2.0 tools and applications for personal or educational purposes more often.

Hypothesis 7: Opinions about ICT tools differ among students and professors.

Regarding ICT, e-learning and online courses the following assumptions are examined:

Hypothesis 8: Professors in higher education prefer ICT tools that are somehow in connection with traditional methods of education, the use of web 2.0 tools is less popular.

Hypothesis 9: Generational differences can be found in the judgement of online courses, e.a. the older the students are, the more important the manageability and clearness of the sites and contents are.

Hypothesis 10: The main reason why the number of online courses are so low is that there are no material, institutional, personal and pedagogical case maps.

To evaluate the data I used the SPSS statistical evaluation system, the results were compared to the hypothesis focusing on significant differences.

The Framework of the Dissertation

In the Introduction I explain the actuality of the topic, introduce the aims, directions, questions, assumptions, antecedents and methodology of the research. I also write about the problems in connection with the research and the main topics. The next chapters can be divided into two bigger parts: a theoretical and an empirical part.

In the theoretical part I review the relevant learning theories, the phrase and characteristics of web 2.0, the connection between online communities and social network. I also talk about web 2.0 and e-learning and their connections to connectivism. In a different chapter I introduce the theories of generations, and point out the digital generation in higher education, the challenges of generation Z in education.

In this topic it is also important to talk about digital accomplishment and digital citizenship. I introduce the questions of ICT competences regarding education. In the next chapter I write about web 2.0 applications in education by introducing a wider range of possible tools.

The second part of the theoretical part deals with the concept and characteristics of e-learning, its origins, history and most important elements. There is also a national and international review in the dissertation, introducing the results of some e-learning test courses and some foreign universities' pilot projects.

The second (empirical) part of the dissertation contains the survey and processes the questionnaires of students and professors. In this section the emphasis is on discussing and examining the results.

The final part reviews the results of the dissertation. I compared my results with the assumptions and I highlighted the most important results, drew lessons and outlined the possibilities for future development. I also made some suggestions for possible researches in the future.

Review and Conclusions

In my dissertation I was trying to find out what the characteristics are of using the Internet among actors in higher education, what their opinions are about the elements of the online educational environment and the opportunities of using web 2.0. I examined the ICT factors (institutional conditions, usage of tools, competences) and the attitudes towards online courses.

According to my examinations, we can state that there are differences due to age among actors of higher education. Although the borderline between generations is not sharp, the significant differences show that the thinking, attitude and behavior of younger people differs from older people in many ways. We can find differences between the use of digital tools among generations.

According to the survey, higher education students (especially those who attend full time training) spend most of their time in front of the computer. For them the Internet is the most important channel of getting information. The research shows that even students find it hard to separate the fields of learning, getting information and communication. For this there can be grounds for the philosophy of connectivism that is built on networks and collective learning. Examining informal learning (which happens unperceived) could make the time spent in front of the computer useful. The most popular sites used nationally are Facebook and YouTube. They are used mainly for keeping contacts and for pleasure, but social sites can be suitable for increasing the knowledge and motivation of young people. Most of their communication happens through social sites, therefore it is obvious for them to talk and to raise questions to each other and to professors about learning online. Professors can have the role of mentors here.

We can state that the development of online higher educational environment is a key factor in knowledge based society, therefore e-learning could be one of the most important element of education in the 21st century. Due to the effects of technological developments in the past decades, nowadays tools and services used for e-learning have widely spread. Now we have the chance to study and find the advantages of new educational methods.

The dissertation has pointed out that students' attitudes are basically positive and expectant towards online courses. One of my aims was to draw up messages and conclusions about online educational environment using the results of the survey. Nowadays even for the youngest generation effective education can happen along the following points, according to my suggestions.

1. Digitalized online educational environment

For generation Z the Internet is a basic environment, virtual area is vital for them, they spend a lot of time on the Internet, they see it as a primary source of information. My research has verified that among younger generations the number of those who spend more than 4 hours a day on the Internet is high.

2. Multichannel online educational environment

Generation Z is multitasking, they use programs and applications and do different things at the same time. Their most popular channels are social sites, chat programs, video and file sharing sites, music programs, online dictionaries, news sites and games. According to my research, members of generation Z use learning organizer programs more often and have a more positive opinion about them than older students.

3. Collective online educational environment

Generation Z uses social sites intensively. A usual user goes on these sites more than one times a day to check if anything new happened. Keeping social contacts happens on these sites as well: the younger the students, the more emphasized the roles of communication and chat on social sites are.

4. Mobile online educational environment

Generation Z uses or would like to use Internet everywhere, WIFI is vital for them. It is important for them that they can access information on every device – smart phones, tablets, e-book readers – because they use these for searching for information and spending time. (in accordance with the 2015 research of Sipos and his partners). Students communicate with each other and with their professors regularly through the Internet. The most popular tools are email and real-time chat.

5. Interactive online educational environment

Generation Z uses Facebook groups more often for sharing educational materials or cooperating with each other and they use their emails less for these purposes. They prefer those forms, where they are not only passive receivers but they can actively experience, make and create things. (Fehér-Hornyák, 2010).

My results may be used to plan and organize higher education trainings – after careful preparation. With the help of an established online higher educational learning environment both the level of education and the contentment of the students can be increased. This research proves, among others, that higher educational environment supports the adaptation of modern technology into education, although there are still some questions. The study had the aim to show that it is important to use social media in higher education and also the development of actors' ICT competences.

I have not found any proof that younger professors had higher ICT competences than older ones. We have to see that the integration of ICT tools into education needs time and money. This kind of change in paradigm could take decades. I want to highlight that action based learning and teaching methods can be useful only if frontal teaching is decreased. As long as the institutions do not force professors to use IT and pedagogical tools carefully, do not help the development of IT infrastructure, and do not offer trainings for teachers, the chance for change stays very low (Sári, 2009).

E-learning has no magic, but it can be a useful and efficient tool to improve competitiveness and can be helpful in the recruiting of students. We can see the opportunities of e-learning more and more clearly which will increase the role of e-learning in future education. In information society the one who holds the knowledge, is popular in the job market. The knowledge of workers fades throughout the years, therefore they have to keep learning and universities have to follow and support lifelong learning. E-learning can be a tool for this if the demands and the will of educational policy meet.

The higher education environment supports the integration of modern technology achievements in the educational environment, but there are still unresolved issues. Its highlighted aim was to demonstrate the importance of the strategic use of modern ICT tools in higher education and the development of education levels of participants in ICT skills.

In many higher education teacher's case it can be said: they have never been forced to use more complex ICT tools, they cannot handle the digital devices. If the instructor does not have preparedness for the usage of the technical tools (ICT skills shortage) he/she will avoid its application in education due to his/her insecurity towards it. (Kubinger Pillman - 2011). This means that in the survey, the computer, projector and slide show (ppt) is not only the most common, but also the tools used the most confidently. In other institutions of higher education can also be a similar situation, digitization is often limited to Power Point slide show of the trainers in their presentations. (Kubinger Pillman, 2011: 50)

One of the most serious ICT competence of teachers in higher education is currently the slideshow -as I could summarize ironically. The spread of the multimedia applications is important, almost everyone uses images, pictures, two-thirds of my respondents uses texts, video films. I did not find convincing evidence to establish that the younger teachers' ICT competencies would be higher than the older instructor mates'.

Teaching attitude may be the key issue of digital development of higher education. The instructors are optimistic and open minded about the web 2.0 regarding e-learning: three - quarters of the pattern think that the new applications represent value in the field of education, and two thirds of them believe that the university should be sure to keep pace with technological development. More than eighty percent of the respondents think that the use of advanced tools are associated with the use of new teaching methods . More than half (57%) of teachers surveyed , that there is no possibility to participate in lectures where ICT tools are used regularly.

Such presentations can be an important advantage where educators can learn about using different instruments and it can help them with making themselves apply these lessons more often. Roughly two-thirds of the sample have not participated in any forums (including online), which would give the possibility to obtain information about the new ICT methods or techniques. They are not informed either about the new pedagogical tools and options (cooperative learning, project work, constructive pedagogy, collaboration) or organizational and methodological background.

The question is, if they get such a small proportion of educational help and does not take part in further training methodology or forums, how they will integrate into their daily teaching practice a high level of digital device usage. In the absence of institutional support and compelling circumstances they cannot be optimistic.

In the case of using the Web's 2.0 tools, the method of should be based on a collaborative teaching management, which on one hand, gives high possibility to access ICT devices, on the other hand, it needs to be accompanied with a strong ICT user competencies (staff, students).

The majority of teachers lack the better knowledge of modern pedagogical principles and methodological tools, especially if we look at the European Union expectations and standards (Kárpáti–Hunya 2009).

The pedagogical methodology is very similar -regardless of age- in higher education: the frontal teaching dominates (lecture, explanation), the most common educational activity is the slideshow in the curriculum. The student information retrieval and processing, communication device usage patterns question the efficiency of methods. If teachers do not learn to speak the language of the netgeneration and apply this in education, the members of the younger generation will turn away from the formal education activity in increasing numbers.

Higher education teachers have the required infrastructure knowledge, but they do not have to translate it into the language of netgeneration. They need to develop new and advanced methodologies for their subjects with the help of their pupils (Prensky, 2001). From the statements referring to generation Z, instructors (over 80%) agreed on two things: the visual stimuli is important for today's students (and there are a great influence on them) ; and they need stimulus environment.

More than 90% of the teachers in the sample attach importance to the two-way communication (and gives high evaluation for the agreement), almost 80% highlights the cooperative techniques in pedagogical methods, two-thirds highlight the project work. The question is what is actually meant by this, because the frontal didactic tools are applied by the majority of teachers in higher education. According to the responses the most common pedagogical activity is the projector presentation of the curriculum. According to the instructors, the most important skills of students should be the understanding and comprehension of texts that cannot be developed through frontal lectures only.

The literacy of texts and effective inquiry in digital texts and in e-learning are important competences in online learning (Papp - Danko 2014). Students also have a preference for collective , interactive problem solving tasks over the frontal education. Higher education needs teaching methodology and didactic reforms. Reform pedagogy does not reach

the higher education system and its rigid and conservative tool system, self-supporting and autonomous knowledge processes stay in the background.

The educational world of universities is a special agent: on one hand, the majority of academic teachers do not have pedagogical qualification, on the other hand, they are given a large autonomy in terms with training tools and methods. They are aware of the new expectations (results of teaching questionnaire show this), that are an important element of the competency-based education, but in practice still the academic routine is relevant, such as frontal teaching (lecture, explanation), which is based on classroom performance.

It is understandable in the absence of monitoring and control and appropriate feedback. Changing attitudes is needed: the "ivory tower" elitist higher education and its representatives must be moving with the times, into services and student-centered direction. The retention factor is the inflexibility of higher education sector and the conservative approaches. Implementation of the frontal teaching has changed, and today teachers use projector and slideshows instead of chalks. The student activity can be increased in classroom teaching, it can be creative- and critical thinking, it can be developing in discussion skills, and problem solving skills.

Higher education teachers' competence needs continuous improvement of ICT competencies in order to become more adaptable and open to the usage of new instruments. This -as the survey research has shown- cannot be provided by all of the institutions. It is worth thinking about the establishment of ICT and an institution learning coordination group, which centrally supports teachers with academics methodological publications, with availability of materials, and with using thematic forums and expert consultation.

Serious institutional strategic development changes are needed to that could build a bridge between competence levels and students' needs. The differences between digital natives and digital immigrants point out development paths, they are giving new opportunities that gives reason for the reconsideration of the existing university education system. There is a complex picture in regard to how the institutions are equipped with the ICT tools and whether the teachers are supported by ICT trainers or training. This is likely to be investigated differently. Autonomous faculties, institutes from the aspect of education, show a very heterogeneous picture, according to the survey. This shows a lack of central coordination of university.

The national higher education experience does not give too many encouraging signs so far, the small number of e-learning courses, the ICT skills of teachers and the poor tool use shows leeway if we look at the international comparisons. Instructors use certain online learning management programs (Neptune, Moodle) for organizing the classes, but the complex web 2.0 tool usage (blogs, social networking, video, audio sharing sites, social bookmarking, etc.) is not widespread in higher education. Most of the teachers cannot confidently use the institutionally imposed online framework (Neptune) either, not to mention the e-learning.

I do not mean to say that the interest in Internet use and openness are age-related factors, it would merely point out that students in higher education have very different training and educational backgrounds, which may affect the demands. Slowly, but teachers' attitudes towards online education is changing. ICT tools need to be built in teaching practice, online technology has to be geared to the needs of youngsters' needs and language too and also the education organization and the curriculum has to be adapted to the new requirements, including the teacher's role in re-evaluation (Olle - Kocsis Molnár -Molnár template - Pápai-Faragó 2015)

For doing this, change is essential in attitudes of the institutions, the frontal teaching activities should be replaced with a more modern approach of education, that calls the teachers to account for the pedagogical efficiency. (Olle 2014). In this study the exact role of

the institutions cannot be explored. We could not overlook the fact that the integration of ICT in educational institution level is time- and money-consuming. Daily use of ICT is increasingly common, however, its integration into education is not seamless (educational ICT tools gives a good overview of Forgó - Antal 2013).

Such a complex paradigm shift in the methodological area would take decades. I find it important to emphasize that the adaptation and implementation of activity-based teaching and learning methodologies in higher education can be effective in parallel with the rate of reduction of frontal teaching. Unless the teachers are forced by the institutions to think about the usage of information and educational tools, the IT infrastructure is developed, and teachers are provided by trainings, there is a little chance for change (Sari, 2009).

It is difficult to decide whether we have such provision in an unfavourable higher education like ours - my research has not been focusing on this issue. It is likely that only a radical reform of higher education will be able to resolve the problem.

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