Use of ICT/WEB in Higher Education in Croatia: The Case of Economics and Management Studies

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The paper presents results of research on the acceptance and use of ICT and advanced web technology among teachers in the higher education process of Economics and Management in Croatia. Acceptance and use of ICT and advanced web technology is estimated by the number and type of digitized materials created by teachers as well as through individual use of different types and frequency of ICT and advanced web technology. Acceptance and use of ICT are assumed to be the result of lessons learned in previous use of technologies, perceived ease of use, perceived usefulness of technology and some 'external' variables. The model used to evaluate the acceptance of the technology is a modified Technology Acceptance Model (TAM). In our model we assumed that the actual use of technology results from a previously acquired intention to use technology and from a previously acquired perceived ease of use and perceived usefulness of technology. That is why the application of the TAM model represents an interpolation of the model on acquired experience. Data were obtained through a stratified online questionnaire, which consisted of 42 questions answered by 98 respondents. The results showed that dependences have lower coefficients of correlation between the constructs related to those obtained in the 'focused' TAM model. The study also showed that, among teachers in higher education institutions in the field of economics and management in Croatia, there is untapped potential for the acceptance and use of ICT and web technologies and that their future use is likely to be more intense if more attention would be paid to training.

Keywords: higher education, Croatia, modified technology acceptance model

Introduction

Formal, informal and non-formal educational processes nowadays deeply rely on ICT and especially on Internet technologies. These technologies are

becoming prevalent in all kind and levels of education, and especially in higher education. It is widely accepted that these technologies bring enormous benefits in availability of data, information and knowledge as well as in efficiency of their usage, information exchange and communication. The use of ICT in education assumes different forms and shapes and that is why learning with the support of ICT is referred to with different terms: digital learning, e-learning, web-learning etc. ICT and web technologies in the context of this paper include different technological solutions that are nowadays mostly accepted in educational processes:

- technology for preparation, creation and presentation of digitized educational materials;
- technology for searching, finding and analysing digitalized educational materials;
- technology for creating and exchanging new knowledge;
- technology that enables communication and cooperation;
- integrated solutions that enable all forms of communication and presentation of different digitized materials, including all forms of social networks;
- technological systems that enable knowledge management by creating, sharing, communicating and evaluating educational materials (LMS).

Despite the fact that these technologies bring advances in educational process (both on teachers' and students' side), the question remains to what extent are they actually used in terms of number, type and frequency of use in particular educational institutions. This needs to be explored for each particular context, as well as for each particular technology and type of user. The research focus of this paper is the use of ICT and web technologies in higher education institutions in the field of economy and management in the Republic of Croatia. Most of the colleges, polytechnics and universities in the Republic of Croatia already introduced most of the mentioned technologies in their educational process. Still the largest and most widely used solutions are standardized digital materials in the form of presentations and digital texts combined with simpler graphics and image documents. The potential of modern technological solutions that enable the creation of richer forms of digital educational content, communication and cooperation among the participants of educational processes (collaboration tools, LMS, databases, specific software solutions, knowledge base, e-learning systems . . .) are used far less often. Despite strong support from the State, there was no formal obligation for the institutions to adopt and implement the mentioned technologies in the educational process. Therefore, diversity

in the scope and use of ICT exists and consequently a perception that there is room for improvement and more intensive use of ICT and web technology in higher education process.

Another research question remains which variables or which groups affect the acceptance of ICT and web technologies in the context of current or improved models that explain the acceptance of technology by certain users.

Aims and Objectives

The primary goal of this research was to determine which ICT and web technology, for what purpose and to what extent and frequency, teachers use it in educational process at higher education institutions of economics and management in Croatia. In addition to that, another aim was to identify and to group variables that affect the acceptance and use of ICT and web technologies by the teachers and to determine dependences among certain groups of variables and to make better predictability of future behaviours, as well as proposing measures for better exploitation of researched technologies in the education process.

For the research of the acceptance of different technological solutions, different models and methods were suggested, among which the most commonly used is TAM model proposed by Davis (1989). Throughout the years, this model has been expanded and modified by both the author and other researchers. According to the revised proposed TAM model (Venkatesh & Davis, 2000), the user's attitude to a technology and its intention to use it will be determined by the user's perceived utility of that technology and the perceived ease of its use. These perceptions can be affected by some environmental variables. The attitude will affect the intent to use, which in turn affects the actual use of technology.

In our research, the actual use of technology will be explored based on experiential attitudes about technology gained through the acquired perceived ease of use, through the perceived usefulness and, finally, through several factors from the environment that may have an impact on technology and the intensity of its use. For this purpose, the revised TAM model will be modified and its usability evaluated in order to better assess the future use of advanced web-IC technology by teachers in the educational process.

Hypotheses

In accordance with the problems identified, aims and objectives of the research as well as its accepted theoretical framework, the following hypotheses are set:

1. There is a (significant) portion of unused ICT and web technology in

the educational process in the studies of Economics and Management in Croatia.

2. Actual use (quantity, type and intensity of use) of ICT and web among teachers in higher education process is affected by:

- acquired perceived usefulness,
- acquired perceived ease of use,
- socio-demographic characteristics of users,
- quality of ICT infrastructure in organizations,
- actual daily use of ICT and web.

We will also check if:

1. there is a statistically significant difference in the production of educational materials (type and amount) among:

- type of institutions,
- gender,
- age group of respondents;

2. perceived ICT and web skills and literacy is in conformance with actual use (quantity, type and intensity of use) of ICT and web in education.

An Overview of Previous Research

Studies conducted on the acceptance of ICT in higher education in Croatia are mostly related to the acceptance by students (Hutinski & Aurer, 2009; Dukić, Dukić, & Kozina, 2012; Gligora-Marković, 2012; Lisek, Brkljačić, 2012) and only one to teachers (Kovačević-Prelas, Vrhovski, & Britvić, 2014). The aforementioned research gives a description of the frequency of use of certain ICT by students and does not investigate cause-effect relations among variables nor does it use any adopted models of technology acceptance.

Other relevant research conducted in Croatia included the acceptance of DSS in small and medium enterprises in Croatia (Dulčić, Pavlić, & Silić, 2012), while Renko and Popović (2015) explored the consumers' acceptance of electronic retailing using a technology acceptance model and confirmed that the variables perceived usefulness and perceived ease of use strongly affect attitudes towards e-tailing and intentions to use it.

There were attempts to explain attitudes towards technology, intention to use it, actual use and user acceptance of technology through different psychosocial theoretical models. Among the first appeared, there was the expectancy-value (EV) (Mazis, Atola, & Kippel, 1975) model and the theory of reasoned action (TRA) (Fishbein & Ajzen, 1975). 'The expectancy value theory was developed to understand motivations underlying the behaviour
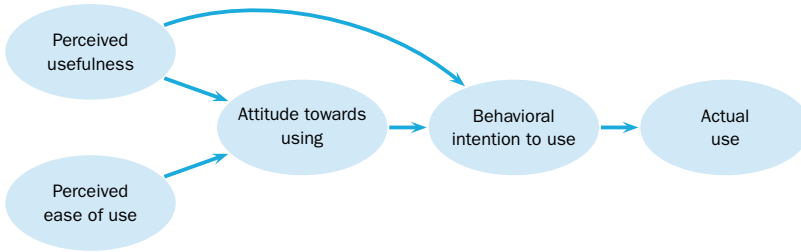
Figure 1   Technology Acceptance Model (adapted from Davis et al., 1989, p. 985)

of individuals. Behavioural intent is posited as the immediate precursor of a particular behaviour. If we understand the elements that influence intention, we can better predict the likelihood of an individual engaging in a behaviour' (Bradley, 2009). According to TRA, 'a person's beliefs and evaluations lead to their attitude (A) toward the behaviour, which in turn leads to behavioural intention (BI). Normative beliefs and motivation affect the subjective norm (SN) which also influences BI.' TRA improved explanatory strengths and predictivity of the E-V model.

The most influential model that has evolved from the previous two mentioned models (theories) is the Technology Acceptance Model, originally proposed by Davis et al. (1989). The model is shown in Figure 1, which shows that Perceived Utility and Perceived Ease of Use are two key variables that will determine the Attitudes towards technology and the Intention to use technology. From the intention and attitude stem actual attainment and use of technology. The basic idea of the model was to demonstrate through the experiment on the user (homogeneous users group) that some relatively homogeneous technology will produce an attitude toward using and an intention to use and consequently to be actively used if users have the feeling and knowledge about the usefulness of the technology and if it is easy to use. Lately, Davis and other authors slightly differentiated the original idea introducing some external variables that may affect the Perceived Ease of Use and Perceived Usefulness of technology (Venkatesh & Davis, 2000).

The model was used in the analysis of numerous individual technologies, where it showed explanatory and predictive powers but also some weakness and shortcomings (Lee, Kozar, & Larsen, 2003; Legris, Ingham, & Collerette, 2003; Chuttur, 2009). Numerous authors introduced other variables or constructs for PU, PEU, AU or BI (Chuttur, 2009).

Some constructs (group variables) are explained and updated in the light of new theoretical approaches, like The Theory of Planned Behavior (Ajzen & Fishbein, 1991) and the decomposed theory of planned behaviour (DTPB). Venkatesh, Morris, Davis and Davis (2003) examine eight competing models of technology acceptance and formulate a unified theory of acceptance

and a use of technology (UTAUT) that integrates elements of these models. The eight models are: TRA, TAM, motivational model, TPA, TAM/TPB combined, a model of PC utilization, innovation diffusion theory and social cognitive theory. UTAUT includes four variables (performance expectancy, effort expectancy, social influence and facilitating conditions) and up to four moderators of key behaviours, gender, age, experience and voluntariness. Goodhue and Thompson (1995) introduced the task-technology fit and individual performance model. Bhattacherjee and Sanford (2006) proposed an elaboration likelihood model. They examined how 'external influences shape information technology acceptance among potential users, how such influence effects vary across a user population, and whether these effects are persistent over time.'

In some recent study on LMS usage by teachers in education, results 'generally supported the proposed model with minor revisions and confirmed the significant influence of perceived self-efficacy (PSE), systems quality (SQ) and facilitating conditions (FC) on the use of LMS by faculty members in higher educational institutions' (Nafsaniath & Ross, 2015).

Models also showed some shortcomings that researches should have in mind when trying to explain acceptance of technology among different kind of users. The main shortcomings of this different version of TAM are (Lee et al. 2003):

- Instead of measuring actual usage, the 36 studies relied mainly on self-reported use, assuming that self-reported usage successfully reflects actual usage.
- The tendency to examine only one information system with a homogeneous group of subjects on a single task at a single point of time, thus raising the generalization problem of any single study.
- The dominance of a cross-sectional study is also an important limitation. Since the user's perception and intention can change over time, it is important to measure these quantities at several points of time.
- Low explanations of variance were referred to as a major problem of TAM studies. In general, 30–40% of the variance of the causal relationship was explained but, in some cases, only 25% was explained by the independent variables.
- Other suggested limitations of TAM studies included single measurement scales, relatively short exposure to the technology before testing, and self-selection biases of the subjects

In addition, Bagozi (2007) warned to other drawbacks:

- the absence of a sound theory and method for identifying the determinants of PU and PEU, as well as other bases for decision making,

- the neglect of group, social, and cultural aspects of decision making,
- the reliance on naive and over-simplified notions of affect or emotions, and finally
- the over dependence on a purely deterministic framework without consideration of self-regulation processes.

Model and Methods

This paper is not intended to carry out an 'experiment' in user-technology relations from which, based on a certain set of questions, the perceived usefulness, perceived ease of use, attitudes towards technology and the intentions for its future use are obtained. In the study of actual use, the current perception of users own abilities to use ICT, the current perception of the usefulness and ease of use (which are actually acquired perceptions from previous experiences), we actually tried to 'interpolate' the model on previously acquired intentions, acquired perception of the usefulness and ease of use, as well as to evaluate some other influential factors that might determine the actual use of ICT and web technology in the educational process.

When used as an 'experimental' model, the TAM generally offers a high degree of consistency in constructs (ease of use and the actual use as well as perceived usefulness and actual use of the technology) measured by the Cronbach test. The question is whether the current users behaviour can be explained equally well by users' obtained perceptions for which we have no evidence on how they were obtained.

Given the advantages and disadvantages of the TAM model, as well as the objectives and hypotheses of this paper work, the researching dependence between the variables will be performed based on the model shown in Figure 2.

The model differs from the original TAM model in that it does not contain variables that describe attitudes towards technology and intents of using technologies. It uses five groups of variables (constructs):

- external variables (socio-demographic – age, gender, type of institution),
- variables of perceived usefulness,
- variables of perceived ease-of-use,
- variables of actual use,
- perceived user's own ICT and web capability and private ICT usage can tentatively be taken as an external variable, which is largely formed out of the studied system.

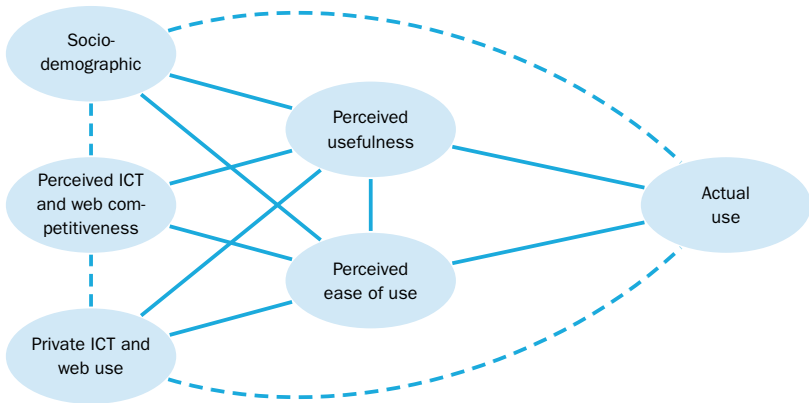The variables were categorized to form the constructs and optionally

Figure 2   Modified TAM Model for Actual ICT Use in Higher Education
with Three Groups of External Variables

(depending on the type of question) recoded, then for each construct the Cronbach-alpha test was calculated. Relations between the constructs were studied through:

- the Pearson product-moment correlation coefficient;
- the Spearman rank correlation coefficient;
- the *T*-test;
- the non-parametric methods (χ^2, Kruskal-Wallis and Man-Whitney test).

For the descriptive statistics, the most appropriate measures of dispersion (variance, mode, median) were used.

Data was gathered through a survey for teachers in higher education institutions (polytechnics and colleges) of economics and management in Croatia during May 2014. In Croatia there are 15 private and state-owned colleges, 12 polytechnics and 9 state universities in which economics and management studies are offered.

The request for filling out online questionnaire was sent to 250 teachers' mail addresses. In a month, answers from 98 respondents from 14 institutions were gathered (a response rate of The questionnaire consisted of the next groups of questions:

- The first group of questions aimed at finding out some socio-demographic characteristics of respondents (type of institution, gender, age);
- The second group of questions revealed to what extent and frequency some of ICT and web technology are used in educational process;

Table 1 Types of Institutions and Socio-Demographic Characteristics of Respondents

Category	Group	(1)	(2)	(3)
Type of HE institution	College	28	28.6	28.6
	Polytechnic	33	33.7	33.7
	University	37	37.8	37.8
Gender	Male	46	46.9	46.9
	Female	52	53.1	53.1
Age	≤30	34	34.7	34.7
	31–50	50	51.0	51.0
	>50	14	14.3	14.3

Notes Column headings are as follows: (1) frequency, (2) percentage, (3) valid percent.

- The third group of questions indicated perceived usefulness of technologies;
- The fourth group intended to find perceived ease of use of technologies;
- The fifth group revealed the perception of respondents' own ICT and web skills, as well as intensity of use of ICT and web in daily life.

The questions were of the next types:

- closed question, with a choice of only one response,
- closed questions, with a choice of more than one response,
- half-closed questions, with a choice of more than one answer and editing personal response,
- Likert scale questions.

Types of institutions and socio-demographic characteristics of respondents are given in Table 1.

Results and Discussion

For the purpose of proving the first hypothesis, the research encompassed:

- intensity of the use of certain types of digitalized materials in the educational process,
- frequency of use of certain technologies in the education process,
- frequency of use of LMS,
- frequency of use of social networks.

Distribution of types of teaching materials used by respondents is shown in Table 2. Frequency of use of particular web technologies (blogs, wikies, podcasts, webcasts, on-line lectures, social networks, text messages, collaboration tools and document-management systems) in educational pro-

Table 2   Distribution of Types of Teaching Materials Used by Respondents

Type of digital educational material	No.
Normal documents (.doc, .pdf, .ppt . . .)	96
Html documents	34
Pictures, drawings, diagrams, graphics	72
Animations, simulations	25
Audio and video recordings	43
Webinar	5
Online questionnaires, evaluation tests	38

Table 3   Frequency of Use of Certain Web Technologies

Type of technology	*N* Valid	Missing	Median	Mode	Percentiles		
					25	50	75
Blogs	94	4	1.00	1	1.00	1.00	2.00
Wikies	93	5	1.00	1	1.00	1.00	3.00
Podcast	94	4	1.00	1	1.00	1.00	2.00
Webcast	94	4	1.00	1	1.00	1.00	2.00
Online lectures	95	3	2.00	1	1.00	2.00	3.00
Social networking	94	4	1.00	1	1.00	1.00	2.25
Textual massages	96	2	4.00	4	3.00	4.00	4.00
Collaboration tools	93	5	2.00	1	1.00	2.00	3.00
Document management	95	3	3.00	3	2.00	3.00	4.00

Notes   Variables have values: 1 – never, 2 – very rarely, 3 – sometimes, 4 – often, 5 – very often. Mode 1 indicates that certain types of web technologies are never used in educational purposes. For most technologies except for exchange of text messages or simpler DMS systems mode = 1.

Table 4   Use of LMS in Educational Process among Respondents

Use of LMS	Frequency	Percentage	Valid Percent	Cumulative Percent
Do not use LMS	44	44.9	44.9	44.9
Use LMS	54	55.1	55.1	100.0
Total	98	100.0	100.0	

cess is shown in Table 3. Learning management systems like Moodle and its Croatian versions Loomen and Merlin enable good organization of digitalized educational materials, communication and cooperation with students, creating tests and questionnaires. However, their use is still not entirely accepted by teachers (Table 4). How Internet is used for a certain educational-research activities is shown in Table 5. Use of social networks among participants is shown in Table 6.

Results shown in Tables 2–6 illustrate that there is a (significant) portion

Table 5 Frequency of Internet Usage for Certain Educational-Research Activities

Category		(1)	(2)	(3)	(4)	(5)
N	Valid	96	95	96	95	95
	Missing	2	3	2	3	3
Median		4.00	3.00	2.00	2.00	4.00
Mode		4	5	1	1	5
Percentiles	25	4.00	2.00	1.00	1.00	4.00
	50	4.00	3.00	2.00	2.00	4.00
	75	5.00	5.00	3.00	3.00	5.00

Notes Column headings are as follows: (1) creating materials for lectures using social network, (2) books and scripts publishing, (3) participate in web conferences, (4) scientific research.

Table 6 Use of Social Networks: Have a Profile on Any Social Network

Category		Frequency	Percentage	Valid percentage	Cumulative percent
Valid	Yes	61	62.2	63.5	63.5
	No	35	35.7	36.5	100.0
	Total	96	98.0	100.0	
Missing	System	2	2.0		
Total		98	100.0		

of unused ICT and web technology in the educational process of Economics and Management studies in Croatia, which strongly supports the first hypothesis. It is not a firm proof of the hypothesis but a good indicator, which otherwise would require accurate data and the calculation of what is adequate use of technology by individual users.

Relations and Dependences among Variables

According to our model and hypothesis we found out that sociodemographic variables (type of institution, age and gender of respondent and type of institution) mainly do not affect the actual use of web and ICT in educational process, which means that hypothesis 2c and 2d are rejected. Some exceptions occur in:

- Age group/frequency of use of the Internet in different educational purposes (age_new/s_v24–s_v28) $\chi^2 = 53.414$, $df = 32$, $p = 0.010$), where it is shown that *younger groups use the Internet more often than older age groups.*
- Age group/having a profile on social networks ($\chi^2 = 9.866$, $df = 2$, $p < 0.001$), where it is shown that *younger age groups have profiles on social networks more often than older age groups.*

Table 7 Cronbach Alpha for the Constructs

Construct	Variables	α
Perceived ICT and web competences	p_v1–p_v2	0.787
ICT and web usage in private purposes	s_v30–s_v45	0.772
Perceived usefulness of internet to improve educational process (PU_1) PU of ICT in educational process improvement (PU_2)	PU_1 (p_v4–p_v8)	0.771
	PU_2 (p_v19–p_v26)	0.858
	PU (p_v4–p_v8–p_v19–p_v26)	0.824
Perceived ease to use web and ICT PEU	p_v3, pv_9–p_v15 (without pv_14)	0.606
	p_v9,p_v12_pv13 (usage of int.)	0.729
Actual use: AU_1 no. of digit. mat. produced by teacher, AU_2 – freq. of use of different tech., AU_3 – internet usage freq. in edu. proc.	AU_1 (s_v1–s_v7)	–
	AU_2 (s_v10–s_v18)	0.777
	AU_3 (s_v24–s_v28)	0.411

- Research of dependencies of gender and other variables has shown that *there is no statistically significant connection between any of the external variables, the variables of perceived usefulness, perceived ease-of-use and the variables of actual use of ICT, and the web technologies and gender variable.*
- Research for dependencies of types of higher education institutions has shown that there is a statistically significant difference between types of higher education institutions only in the use of LMS systems (type_VU/use_LMS) (χ^2 = 14.653, *df* = 2, *p* = 0.001). *In universities LMS is used more than in colleges and polytechnics.*

For variables that represent constructs, an analysis of consistency (reliability) through a Cronbach alpha test was performed. The results are shown in Table 7. Poor Cronbah alpha test for PEU is probably the result of insufficiently precise questions, i.e. combinations and ways of grading the responses (from positive to negative and vice versa). Although variables were recoded in the calculations, some information content was lost due to inconsistent unidimensionality. All constructs except the sub constructs AU (AU_3, 'Actual use – using internet for educational purpose') have lower level satisfactory value (Cronbach alpha > 0.70).

Dependencies between variables were examined based on the model shown at Figure 2. Results are given in Table 8.

The results show that:

- Actual use (AU_3) has weak connection with perceived usefulness (PU_2), which partly confirmed hypothesis 2a.
- There is weak connection between actual use (AU_1) and perceived easy to use (PEU), which partly confirmed our hypothesis 2b.
- Actual use (AU) (frequency, number and type of digitized material and

Table 8 Correlations among Constructs

Constructs		PU_1	PU_2	PEU	AU_1	AU_2	AU_3	PIS	PDU
PU_1	p_v4–p_v8av	0							
PU_2	p_v19–p_v26av		0						
PEU	p_v3_p_v9–pv_15av		0.226	0					
AU_1	s_v1–s_v7av			0.252	0				
AU_2	s_v10–s_v18av				0.521	0			
AU_3	s_v24–s_v28av	0.281					0		
PIS	p_v1–p_v2av		0.280		0.521	0.388		0	
PDU	s_v30–s_v45_av				0.367	0.470	0.567	0.426	0

frequency of web technology usage) is in the highest dependency (near to and moderate) with the frequency and number and type of use of web and ICT in private life (PDU). Thus hypothesis 2e is confirmed.

Research confirmed weak connection between Perceived easy to use (PEU) and perceived usefulness (PU_2).

Perceived ICT competence (PIC) can also be considered as an attitude towards ICT. In the research based on the original TAM model, the attitude towards technology affected the intention to use and the actual use of technology. This paper has partially confirmed this statement (PIC is in weak connection with AU_1 and AU_2).

Conclusions, Limitations and Recommendations

ICT and advanced web technologies (web 2.0), which were shown good in education, nowadays are in their mature phase and the question is not whether to use them or not, the question is to what extent to use them and when to use them.

The research has shown that teachers of higher education institutions in the fields of economics and management mostly prepare digital educational materials using standardized technologies (simple and/or extended tools for office use). Other 'richer' ICT and web technologies are used to a far lesser extent, which, from this aspect, has confirmed the assumption that ICT and web technologies are not used sufficiently in educational processes. That was confirmed by mode of the number of used educational materials.

Research on the frequency of use of particular ICT and web technology has shown that newer technological solutions (web 2.0) are used rarely or never and that field is abundant with unused opportunities. This is especially important because of the fact that the respondents usually belonged to younger age groups.

LMS systems that are used nowadays in educational process are integrative, documental, communicative, collaborative tools, which open numerous opportunities in digital education but are also not used enough as well. The same situation relates to the use of social networks. Reasons for that probably emerge from the fact that the use of different ICT and web technologies is a matter of the individual orientation of teachers and not organizational or task-based orientation. This is corroborated by the fact that teachers pointed out as critical elements the need for organized training for the use of ICT and web 2.0 technologies, the price of the training and the support of the management.

Research has shown that respondents who use ICT and web technologies for personal needs outside of the educational process, at the same time use these technologies more in the educational process. On the other hand, teachers who use ICT and web technologies to a lesser extent often think that students do not have enough ICT and web knowledge. Also they often think that their low production of digitalized educational materials is partly caused by the quality of ICT and network equipment in the institution they work. However, some additional analysis confirmed that the equipment is not an obstacle.

In most researches in which TAM was used (Legris et al., 2003; Chuttur, 2009; Li, 2015) it was shown that there are weak dependencies between the actual use of technology and perceived usefulness. This was also confirmed in this research. The research also confirmed (weak) dependency between intensity of use of ICT and web technologies and perceived ease-of-use. In future research, for this construct a more homogenous group of question has to be defined. In addition, weak dependency between perceived ease-of-use and perceived usefulness of ICT and web technologies was confirmed.

When it comes to perceptions of future use of educational technologies, the biggest importance for teachers will be in software solutions that will enable support of dynamic and individual pace of studying as well as LMS systems with already existent abilities as well as new collaboration possibilities.

From the results we can cautiously conclude that the ease of use will be a key factor in the future use of technology. However, in order to create the perception of ease of use of the technology, it is necessary to present it adequately to the prospective user, which proved to be an important requirement by most of the respondents. It will also be an important requirement to set up continuous institutional teacher training in new technologies.

The conducted research has some limitations that have to be taken into consideration when interpreting the results. The first limitation emerges from the size or the representativeness of samples. As it was stated in the

introduction, respondents were teachers of higher education institutions (colleges, polytechnics and universities) who teach in economics and management studies. In that way, the sample represents only one segment of teachers of higher education institutions. The sample is not consistent with the number of representatives of certain types of higher education institutions as well as age or gender structure of certain institutions. Secondly, limitation emerges from the measuring scales of certain variables and constructs. This was indicated in the cases of variables with three values of the measured attribute. Also, using heterogeneous measuring scales for variables in certain constructs decreased the value of the Cronbach alpha test and made it questionable. For variables that have alternative values that are not mutually excluded (Measures and their importance for ICT usage in HE; Perceived importance of ICT for future), more valuable answers could have been obtained if certain options were ranked by significance not if only one option was chosen as the most important one.

The TAM model has proven to be good in analysis of relatively simple specific technologies with constructs that had 5–10 variables and same measuring scales. The homogeneity of variables in a construct was usually relatively high. Correlation coefficients between constructs were also relatively high.

The model used in this research is a modification of TAM model and it has shown usability in analysing technology that is not a simple technological solution but a group of more complex technological solutions. Aforementioned technologies are not particular technological solutions but can be integrated into complex technological solutions that offer more options in creating digital materials and use of those materials in educational purposes. That is why some constructs had lower values of Cronbach alpha (from 0.7 to 0.8) so even alpha = 0.606 was used in analyses. Also, because of the same reason, dependencies between constructs have shown relatively low correlation coefficients which in that context can be considered acceptable and the suggested modified TAM model can be considered as a usable model for similar analyses.

The model, as mentioned above, has its limitations, which are primarily derived from its linear structure in the study of the dependence among constructs. Creating a perception of usefulness, creating the perception of ease to use and the actual use has in the longer period of time a circular psychological effect. This means that the ease of use will encourage action and use of technology. Using technology (even in such a broad sense as the work presented) will open new prospects and expand the perceived usefulness. Using technology brings ease of use to a higher level of complexity of the technology, which can expand the perceived usefulness.

In future research, propensity to use new ICT and web technologies have

to be explored using larger user groups and with combinations of variables other than those contained in perceived ease of use and perceived usefulness. Special attention will have to be paid to the so-called external variables, for which there is almost no consensus on the choice and the grouping of these variables. Non-linear relationships between variables will be necessary to be researched using sophisticated methods such as decision trees, neural networks, machine learning algorithms and other classification algorithms.

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