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Aug 10th, 12:00 AM

Interaction Enjoyment Perspective in Explaining Technology Acceptance: a Study of Employees' Acceptance of M-Learning

Michał Kuciapski
University of Gdansk, m.kuciapski@ug.edu.pl

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Completed Research

Michał Kuciapski
University of Gdansk
m.kuciapski@ug.edu.pl

Abstract

Specificity of communication with devices and applications via touch or peripherals indicates that user interaction and its enjoyment plays an important role in their acceptance. Consequently the study validates interaction's enjoyment as a set of variables, influence on technology acceptance with proposed model explaining employees' intention where m-learning use for competences development was chosen as a reference technology. A structural equation modelling approach was used to validate the model on the basis of data collected via a survey from 728 employees from 24 sectors, both public and private. Study results proved that inclusion of interactive enjoyment perspective in technology acceptance models allows to better explain the intention to use a particular technology. Particularly variables such as: user autonomy, system interactivity, system accessibility and system satisfaction occurred to be significant factors influencing m-learning acceptance by employees for knowledge transfer.

Keywords

Interaction enjoyment, technology acceptance, mobile technologies, m-learning, employees.

Introduction

Many job positions require constant development of knowledge and skills. Employees require to have access to tools that will give them fast, flexible and convenient means of competences development. Providing quick and permanent access to professional knowledge necessitates the use of digital materials via applications on mobile devices. Such a form of learning is called mobile learning (m-learning), and can be defined as 'a distance learning model which is designed to meet education needs with the help of mobile devices' (Korucu and Alkan 2011). As a result, m-learning is unique in terms of time flexibility and location (Peters, 2007) and is treated as a new and independent part of e-learning (Cho 2007).

M-learning solutions can be extremely beneficial to the learners' skill development (Chen and Hsiang 2010). They can assist learners in: searching for, retrieving, creating their own, sharing, and managing knowledge. Accordingly to (Sung at al. 2016) the overall use of mobile devices in education is more effective than desktop computers or when not using mobile technologies at all. Inclusion in mobile applications teamwork communication and collaboration led to elaboration of mobile learning 2.0. M-learning 2.0 is defined as 'integration of social media into mobile learning' (Navarro et al. 2016) and has proved to be an effective solution for collaborative experience sharing, which is important during competences development process (Shen et al. 2017). M-Learning 2.0 can create a learning environment that is more authentic, collaborative, communicative, engaged and effective (Liu and Huang 2017). Mobile technologies contribute to improving the accessibility, interoperability and reusability of educational resources, and to enhance the interactivity and flexibility of learning at convenient times and places (Murphy 2006, Kuciapski 2016).

Mobile devices and applications have many barriers standing in the way of their convenient use. These are connected with technical, psychological, pedagogical, organizational and financial issues. Technical issues include small screens with low resolution, inadequate memory, slow networks speeds, and a lack of standardization and compatibility (Lowenthal and 2010; Park 2011). Psychological limitations are related with people being more likely to use mobile applications for entertainment such as texting with friends or checking social network services, rather than for instructional purposes (Park 2011). Pedagogical problems concern the distraction of students or employees and the interruption of class progress through the use of mobile devices (Gu 2011; Hwang and Chang 2011). As indicated by Krotov (2015) a successful mobile learning initiative may require resources beyond mobile hardware, software, and IT personnel. Allocations may involve setting up an additional organizational structure with personnel responsible for: implementing m-learning, providing administrative support, assigning experts from many fields during m-learning projects and improving the existing infrastructure.

Moreover mobile technologies acceptance factors impacting their successful implementation and use in organizations might depend on culture (Thomas et al. 2013) or even ethnicity (Liew and Vaithilingam 2014). Culture, as proven by Chopdar and Sivakumar (2018) also moderates which determinants influence on intention to continue usage of mobile applications.

Researchers point out many factors that influence on technology acceptance and that are connected with direct interaction with devices and applications. Flexibility in using technology supports the students' intention to continue the use of mobile learning (Huang et al., 2014). Interactivity, mobility and enjoyment are also recognized as important factors influencing m-learning by students (Ali and Arshad 2016), especially if they support higher efficiency in knowledge and skills development (Sharma et al. 2017). Online communities-of-practice, if communication processes are organized in an highly interactive way, occurred to be an important stimulator for entrepreneurs to learn and share knowledge (Hafeez et al. 2018, Kuciapski 2019). Tan at al. (2014) confirmed that personal innovativeness in information technology use positively impacts the students' intention to use m-learning. Joo at al. (2014) proved that personal innovativeness should not be only narrowed to information technology. Kuciapski (2017) in a study with employees as the target group, highlights that providing autonomy in using mobile technologies, as well as similar usability of m-learning applications to alternative solutions like traditional courses or e-learning, strongly influences on the intention to use mobile learning for knowledge transfer. Factors that refer to learning and teaching processes, such as: perceived content quality, long-term usefulness and learnability have been proven as important determinants for m-learning adoption by students (Abu-Al-Aish and Love 2013).

Listed assumptions highlight that usability understood as: effectiveness, efficiency, enjoyment and satisfaction in a particular context of use (Bevan 2015, Armeen et al. 2019) seems to be very important in explaining technology acceptance. Usability meaning could be extended as providing interaction enjoyment during devices and applications use. It would be highly beneficial to integrate various technology acceptance factors connected with usability in technology acceptance model to comprehensively verify their impact on behavioral intention to use technology. Therefore, the purpose of the article is to validate technology acceptance determinants from interaction enjoyment perspective. The second point of the paper presents review of technology acceptance determinants connected with usability and interaction with applications. It is a starting point for proposing in the third point of the paper technology acceptance model from interaction enjoyment perspective where similar approach was not found in subject matter literature. The fourth point of the paper presents research methodology and the fifth one study results. Importantly, research results interpretation from theoretical and practical perspectives is included in the sixth point of the article. The paper finishes with conclusion.

Related Research

Shackel (2009) reveals, usability is not only conceived of as ease of use but also equally involves efficacy in terms of measures of (human) performance. As a result Shackel (2009) proposes a definition of usability as 'the capability in human functional terms to be used easily and effectively by the specified range of users, given specified training and user support, to fulfil the specified range of tasks, within the specified range of environmental scenarios'. Such a broad interpretation of usability was assumed in the paper during selection of technology acceptance factors related with interaction enjoyment presented in subject matter literature. Interaction enjoyment we define as having positive feelings during conducting activities with devices and applications. Interaction enjoyment is also understood as a convenience and comfort in conducting activities with technology, causing user satisfaction of its using. Table 1 contains synthesis of subject matter literature review to explore for technology acceptance variables connected with interaction enjoyment, justifying that interaction enjoyment can be treated as a grouping variable. Referenced theories and models were: Activity theory (AT), Innovation diffusion theory (IDT), Unified theory of acceptance and use of technology (UTAUT), Technology acceptance model (TAM) and Theory of planned behaviour (TPB).

Variable	Study	Research group	Technology	Basic model	Definition/Meaning
Effort expectancy (EE)	Venkatesh et al. 2003	students and employees	online meeting man. database application, portfolio analyser, accounting system	UTAUT	'The degree of ease associated with the use of the system.'
Ease of Use (EU)	Rogers 1995	employees	social system	IDT	'The degree to which an innovation is perceived as being difficult to use.'
Perceived ease of use (PEOU)	Davis et al. 1989	MBA students	word processing program	TAM	'The degree to which a person believes that using a particular system would be free from effort.'
Perceived control & skill (PCS)	Park et al. 2014	graduate and undergraduate students	social network services	TAM	'The users' perception of how challenging it is to play MSNG and how skilful the user is when playing the game.'
System satisfaction (SS)	Liaw et al. 2010	students	m-learning	AT	Satisfaction from using technology for conducing activities.
System enjoyment (SE)	Alrawashdeh et al. 2012	public sector employees	web-based training system	UTAUT	The extent to which the activity of using the system is perceived to be enjoyable.
Perceived enjoyment (PE)	Praveena and Thomas 2014	graduate and undergraduate students	Facebook	TAM	'Reflects the pleasure and enjoyment associated with using a system.'
Satisfaction (S)	Park and del Pobil 2013	various users	LTE services	TAM	'Users' satisfaction with a system or service.'
System functions (SF)	Liaw et al. 2010	students	m-learning	AT	Easiness of using system's or application's functionality.
System activities (SAC)	Liaw et al. 2010	students	m-learning	AT	Convenience of interaction with the system or application to conduct activities.
Perceived self-efficacy (PSE)	Cheon et al. 2012	college students	m-learning	TPB	'Judgment of general ability to perform a behaviour.'
System accessibility (SA)	Park et al. 2011	students	m-learning	TAM	Easiness of conducting actions thanks to internal application support in conjunction with application capability with other solutions.
System interactivity (SI)	Abbad et al. 2009	students	e-learning system	TAM	Technology promotes increased user interaction.
User autonomy (UA)	Kuciapski 2017	employees	mobile technologies for knowledge transfer	UTAUT	'Perceived autonomy and flexibility in technology use.'

Table 1. Technology Acceptance Variables Connected with Interaction Enjoyment

Juxta pointed variables in Table 1 are not only included in studies based on often extended models or theories like TAM or UTAUT, but also in less popular ones as: AT, IDT and TPB. Students were usually a research group (undergraduate, graduate, MBA) and a few studies were conducted among employees. A wide spectrum of technologies acceptance has been validated: m-learning, e-learning, social network services, online meeting manager, database application, portfolio analyzer, desktop accounting system, word processing program and LTE services. Listed assumptions in conjunction with significant timespan of conducted studies, from 1989 to 2017, prove that studying technologies usability from interaction perspective is important to better explain of users' intention to use devices and applications.

Not only extended models based on general ones but also some of classical models and theories introduce technology acceptance factors related to enjoyment, satisfaction or convenience of system use (Table 1): TAM – perceived ease of use, UTAUT – effort expectancy and IDT - ease of use.

UTAUT contains also performance expectancy (PE) that seems to be connected with usability. PE is defined as 'The degree to which an individual believes that using the system will help him or her to attain gains in job performance' (Venkatesh 2003). It was omit in Table 1 as it is not related to interaction enjoyment with devices and applications but with obtaining work results – they can be achieved even if the user does not enjoy technology.

Vast of variables have definitions proposed by the articles' author (Table 1), but there are also the ones where variable explanation was not included in the paper. In such a situation a proper definition was proposed based on the text in the article and variable's assertion statements.

Variables in Table 1 have been set together according to the similarity in their meaning. Such groups of highly convergent variables are:

- effort expectancy (EE), ease of use (EU), perceived ease of use (PEOU) and perceived control & skill (PCS);
- system satisfaction (SS), system enjoyment (SE), perceived enjoyment (PE) and satisfaction (S);
- system functions (SF), system activities (SAC) and perceived self-efficacy (PSE).

During creation of proposed technology acceptance model it was assumed not to include factors with similar meaning factors. Model construction is presented in the third point of the paper.

Research Method

As presented in the second point of the article many technology acceptance variables connected with interaction enjoyment have similar meaning. Therefore for all listed groups of convergent determinants only one variable was chosen based on the following criteria (Figure 1):

- the generality of meaning – SF instead of SAC and PSE;
- broader presentation in subject matter literature: EE instead of EU and PCS;
- the level of technology explanation by model – EE existing in UTAUT instead of PEOU included in TAM, because UTAUT explains technology acceptance in 70% and TAM in 30% respectively (Shaper and Pervan 2007);
- model's more direct connection with technology acceptance – EE existing in UTAUT instead of EU included in IDT, as IDT is more related to technology diffusion than acceptance;
- date of publication – SS and SF were published before others.

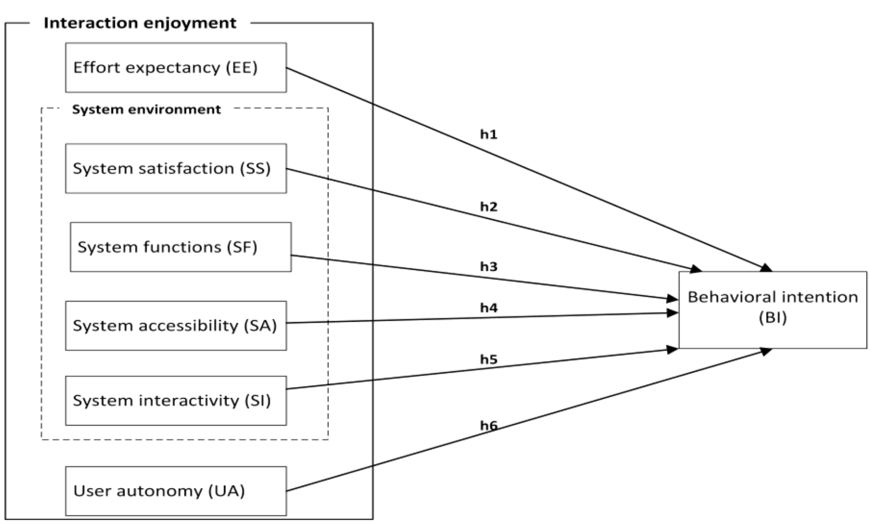

Figure 1. Research Model

The validity of proposed model (Figure 1) was verified with stated research hypotheses (Table 2). One hypothesis was formed for each connection between independent variables and dependent one, behavioral intention to use technology (BI). Hypotheses construction included model's validation perspective - technology as m-learning for competences development by employees. Mobile learning technologies have been chosen as reference ones for verifying interaction enjoyment perspective in technology acceptance, as mobile solutions are ubiquitous in nature and m-learning requires frequent and broad interaction with devices and applications, as well as between users.

Hyp. no.	Connection	Description
H1	EE->BI	Effort expectancy impacts on the intention to use m-learning by employees.
H2	SS->BI	System satisfaction impacts on the intention to use m-learning by employees.
H3	SF->BI	System functions impacts on the intention to use m-learning by employees.
H4	SA->BI	System accessibility impacts on the intention to use m-learning by employees.
H5	SI->BI	System interactivity impacts on the intention to use m-learning by employees.
H6	UA->BI	User autonomy impacts on the intention to use m-learning by employees.

Table 2. Research Hypotheses

The research data was collected via a CAWI survey, during f-2-f meetings in a vast majority of cases. To be able to generalize the results, the survey data was collected from many organizations from both public and private sectors and with a diverse number of employees, representing 24 sectors altogether. The survey was conducted among 922 employees, among whom 847 knew how to use mobile devices, applications and services, and were able to report on their experience. Survey participants through assertion statements assessed interaction with m-learning technologies taking into account both devices and applications aspects.

The data was collected over a 14 month period starting from December 2016. Eventually, 728 employees filled in the questionnaire, giving a response rate of 86%. The questionnaire began with an explanation of key concepts, such as: m-learning, mobile devices and knowledge transfer. The second section of the questionnaire consisted of classification data and is presented in Table 3.

Category	Values	Number	Percentage
Age	=<20	45	6
	21-30	507	70
	31-40	120	17
	41-50	47	6
	> 50	9	1
Job internship (years)	< 3	244	34
	3-5	229	31
	6-10	138	19
	11-20	98	13
	> 20	19	3
Number of hours of using mobile services within a week	1-5	227	31
	6-10	119	17
	> 10	382	52

Table 3. Survey Participants Classification

As presented in Table 3, the survey included responses from participants with a variety of characteristics. Significantly, the survey participants represented a range of experience in using mobile devices and services – from beginners to seasoned practitioners. Moreover the aspect of voluntariness of use of m-learning solutions was exemplified – 32.7 of participates reported to be required to apply mandatory applications. This allowed the survey results to be generalized.

The crucial third part of the survey included 24 statement assertions formulated in accordance with acceptance questionnaires rules – 3-4 statements for each variable. Each question was measured using a 7-point Likert scale. The assertion statements in the survey were created for all variables included in elaborated model for explaining technology acceptance from interaction enjoyment perspective, presented in Figure 1. Assertion statements were prepared analogically to referenced articles (Table 1) while also taking into account m-learning and the competences development context.

A data validity test was performed to reduce the possibility of receiving incorrect answers during the data collection period (Sekaran and Bougie 2016). It showed that all 728 questionnaires were valid. The inter-construct correlation coefficient estimates were examined along with a particular item's internal consistency by using Cronbach's alpha coefficient estimates (Tavakol 2011). Reliability values greater than 0.7 are considered as acceptable. When values are over 0.9, variables are considered to have excellent internal consistency. All items far exceeded the recommended level and most of them were in the highest range. As a result the data is internally consistent and acceptable, with a total reliability equal to 0.933.

The study used structural equation modelling (SEM) for analyzing data collected via the survey. The advantage of SEM is that it considers both the evaluation of the measurement model and the estimation of the structural coefficient at the same time. A two-step modelling approach, recommended by Anderson and Gerbing (1988) was followed. The confirmatory factor analysis (CFA) was carried out first to provide an assessment of convergent and discriminant validity. Then SEM was applied to provide the path coefficients with significance tests allowing the stated hypotheses to be verified. Such research methodology ensures the correctness of a given model. Existence of independent variables' impact on dependent variable was verified with significance (p) tests. The strength of influence was measured by calculating the standardized β-coefficient.

Research Results

Model fit indices values checked via CFA, that is an integral part of SEM are presented in Table 4.

Fit indices	Recommended value	Result
$\chi 2$/d.f.	<3	2.569
GFI (Goodness of Fit Index)	> 0.8	0.877
CFI (Comparative Fit Index)	> 0.9	0.943
AGFI (Adjusted Goodness of Fit Index)	> 0.8	0.837
RMSEA (Root Mean Square Error of Approximation)	< 0.08	0.078
NFI (Normed fit index)	> 0.8	0.921
Fit indices	Recommended value	Result

Table 4. Fit Indices of Model

Six fit indices satisfied by the elaborated model (Table 4) confirm its validity and enable, through regression analysis to verify the 6 stated hypotheses given in Table 2 and included in Figure 1. Research hypotheses verification results are contained in Figure 2.

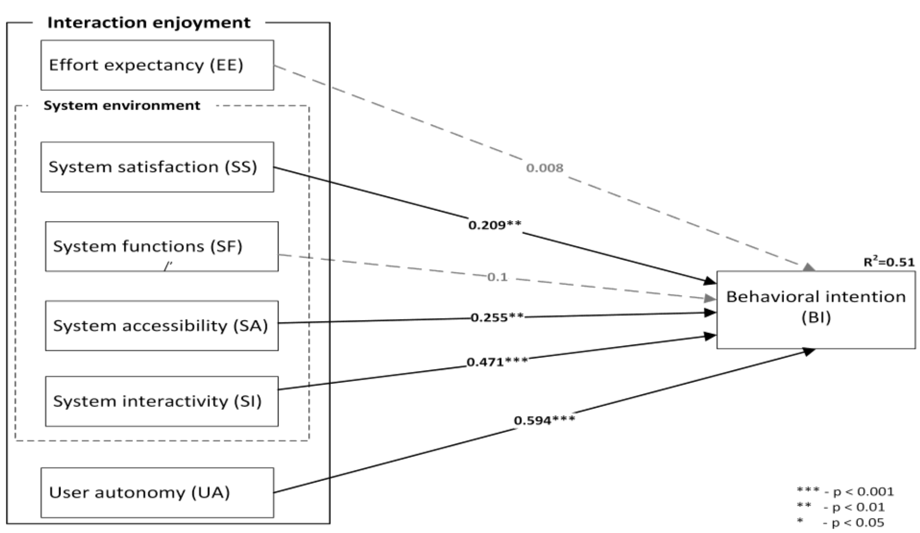

Figure 2. Technology Acceptance Model from Interaction Enjoyment Perspective – Verification Results

According to Figure 2, four of six hypotheses were positively verified.

Discussion and Implications

Interpreting at the outset the theoretical aspects user autonomy (UA) and system interactivity (SI) occurred to be far the most important technology acceptance factors from interaction enjoyment perspective as fifth hypothesis (H5) and six hypothesis (H6) are confirmed. Key role of UA in explaining behavioral intention to use technology (BI) complies with study results of Kuciapski (2017). Both variables impact on BI was very significant as p-values in each case were below 0.001. The strength of UA's influence on BI is very high (β=0.594). It means that employees expect to have a possibility to individually choose m-learning solutions for competences development as well as to have availability to use mobile devices and applications in a highly flexible and autonomous manner. SI impact on BI is lower than existing from UA, but still on a high level, with standardized β-coefficient having value of 0.471. For employees it is important that m-learning systems allow for immense interaction with them, without unnecessary waiting for the completion of particular actions and necessity to conduct superfluous steps.

Apart from UA and SI two other variables connected with interaction enjoyment perspective occurred to affect BI, but in a much lesser extent. As fourth hypothesis (H4) was supported (p=0.006) system accessibility (SA) influences BI (Figure 2). The strength of impact is moderate (β=0.255) meaning that it is desirable for m-learning solutions dedicated for competences development by employees, to include internal functionality supporting easiness of conducting actions. Similarly to SA, system satisfaction (SS) has moderate (β=0.209) impact on BI, hence second hypothesis (H2) is confirmed (p=0.004). As a result it is not crucial but desirable that employees feel enjoyment during m-learning applications use.

Two variables as effort expectancy (EE) and system functions (SF) turned out not to influence on the intention to use m-learning by employees, hence p-value for first (H1) and third hypothesis (H3) was higher than 0.05 reference value (Figure 2). Effort perceived by employees, required to use m-learning does not influence on the intention to use mobile devices and applications for competences development. Such result is a bit surprising as SA and SI variables are confirmed to influence on BI, and they are related to easiness of using applications, that also means limiting the effort required to use m-learning. Also SF occurred not to be important for explaining m-learning acceptance by employees. Therefore easiness of using m-learning applications' functionalities and the number of them do not influence on the employees intention to utilize mobile devices and software for competences development during knowledge transfer. Analogical to EE it is a bit surprising in the context of confirmed hypotheses for SA and SI variables. It can interpreted that in m-learning applications for employees it is not important to have access to a large number of very easily executed functionalities (SF) with a low effort (EE) to learn how to use them. It is important however to have immediate, application-internal support in case of problems (SA) and being able to quickly and fluently interact (SI) with software solutions. Lack of EE and SF influence on technology acceptance that was positively verified in other studies, confirms that intention to use devices and applications might depend on culture (Al-Gahtani et al. 2007; Venkatesh and Zhang 2010; Thomas et al. 2013) or even ethnicity (Liew and Vaithilingam 2014). Figure 2 presents verified technology acceptance model from interaction enjoyment perspective.

Elaborated and validated model explains behavioural intention to use mobile technologies for knowledge transfer by employees (Figure 2) in 51 percentage (R2) that is a quite high value in technologies acceptance field. As the model examines only one technology acceptance perspective - interaction enjoyment - the R2 value can be considered as a very high. Therefore it is important to include interaction enjoyment perspective in models for technologies acceptance. Inclusion of variables connected with interaction enjoyment allows to achieve higher values for explaining (R2) depended variable (BI).

The research results also have a few important implications for practitioners. First of all, user autonomy (UA) as being the most influencing factor (β=0.594) on the intention to use mobile technologies for competences development (BI) means that employees would like to have the possibility:

- to select mobile applications like virtual classroom that they find convenient for the knowledge transfer,
- to personalize mobile solutions' user interfaces and the way of their functioning (like basic or advanced mode) accordingly to their individual needs,
- to use same mobile technologies on various operating systems.

System interactivity (SI) high influence on BI, highlights that mobile applications used for competences development should provide fluent realization of actions with as quick as possible interaction with user interface. Therefore they are required to include mechanisms ensuring fast response time to conducted actions by: asynchronous loading and refreshing of forms' panels, quick access to tooltips; and a broad spectrum of filtering and sorting mechanisms for presenting data. Also during executing action users should not be forced to conduct particular steps on many separate forms.

System accessibility (SA) impact on BI even significantly lower than the one from UA and SI is still important (β=0.255). As a result it is desirable to provide a broad internal support in mobile applications that are used for competencies development during knowledge transfer processes. When realizing actions employees should be supported with instant feedback when having problems, inline help for particular fields and context help system with links to tutorials and best practices.

System satisfaction (SS) impact on BI is on similar level as for SA (β=0.209). Therefore employees should enjoy using m-learning for competences development. Providing highlighted mechanisms related to other confirmed variables as UA, SI and SA would also support SS. Moreover it seems to be important for m-learning solutions to provide the opportunity to rate applications or leave feedback.

Effort expectancy (EE) and system functions (SF) turned out not to influence on the intention to use m-learning by employees. During designing mobile applications for knowledge transfer it is not important to ensure their simplicity in relation to desktop versions that would decrease time required to learn how to use mobile solutions. Also the number of system functions (SF) and ease of their utilization in mobile applications used for competences development is not of much importance.

Conclusion

The study investigated technology acceptance explanation by determinants connected with interaction enjoyment. Research results showed that acceptance of m-learning for competences development by employees is explained in 51 percent by variables classified as connected with interaction enjoyment. The level of technology acceptance explanation by only one area – interaction enjoyment – has to be considered as a very high. Therefore inclusion of interactive enjoyment perspective in technology acceptance models allows to better explain intention to use particular technology. The most important interaction enjoyment factors according to the significance (p) and the strength of influence (β) on intention to use technology were: user autonomy, system interactivity, system accessibility and system satisfaction. System functions and effort expectancy occurred not to impact on employees intention to use mobile technologies for knowledge transfer. It highlights that even generally interaction enjoyment is important determinant of technology acceptance, individual variables connected with it might not influence on intention to use particular types of applications, like studied m-learning ones.

It is important for practitioners to design or choose m-learning solutions used for knowledge transfer that allow for high user autonomy and system interactivity. Study proved that they are key determinants impacting m-learning acceptance by employees from interaction enjoyment perspective. It is crucial that implemented in organizations solutions allow employees to: select mobile applications accordingly to their preferences, personalize mobile solutions interfaces and use same applications for different types of devices and operating systems. Moreover it is very important to ensure that mobile applications used for competences development support fluent realization of actions with quick response times from user interface and no need to do unnecessary steps.

The study has some limitations that create opportunities for future research. The level of explanation (51 percent) of dependent variable shows that maybe not all technology acceptance determinants connected with interaction enjoyment perspective were included in model. Moreover two variables as effort expectancy and system functions have been rejected to influence on the intention to use m-learning by employees for competences development. As it is contrary with other studies, further verification for other target groups and in different countries should be conducted, to check whether these variables are not culture dependent.

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