Assessing acceptance toward wiki technology in the context of Higher Education

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ABSTRACT

This study investigated undergraduate students' intention to use wiki technology. An extension of the Technology Acceptance Model (TAM) has been used by taking into account not only students' wiki perceived utility and usability, but also Big Five personality characteristics and two other variables, social norms and facilitating conditions, as proposed in the Unified Theory of Acceptance and Use of Technology (UTAUT). Students' beliefs before (pre-wiki scenario) and after (post-wiki scenario) the actual use of the wiki system were investigated, with 85 and 86 participants respectively. The hypotheses were tested using partial least squares analysis. For the pre-wiki scenario, 8/15 hypotheses were confirmed and 11/15 for the post-wiki scenario. The relationship between perceived ease of use and perceived usefulness was found to be of the highest magnitude. The most notable difference across the two scenarios was that the relation between perceived ease of use and attitudes towards use was significant only in the first scenario. The results demonstrate that the proposed TAM-extended model could predict students' wiki acceptance.

Keywords

Technology acceptance model, usefulness, ease of use, system usability scale, big five personality characteristics, social norms, facilitating conditions, wikis, partial least squares.

Introduction

Wiki is a Web 2.0 technology which emphasizes collaborative writing by adding, modifying or deleting content (West & West, 2009). The open nature of wikis creates opportunities for learning (West & West, 2009; Wheeler & Wheeler, 2009). On the other hand, West & West (2009) indicate that without any proper planning and familiarity with technology, wiki activities wouldn't be successful. Therefore, wikis can facilitate group learning (Altanopoulou, Katsanos, & Tselios, 2014; Altanopoulou & Tselios, 2015; Altanopoulou, Tselios, Katsanos, Georgoutsou, & Panagiotaki, 2015) and reduce the tutor workload (Kear, Donelan, & Williams, 2014) given that a careful design has been adopted.

Wiki as a collaboration tool promotes writing skills (Wheeler & Wheeler, 2009) and improves learning (Ben-Zvi, 2007). Also, wiki projects can support collaborative knowledge creation (Ben-Zvi, 2007; Wagner, 2004; West & West, 2009), promote critical thinking and contextual application (West & West, 2009).

However, as discussed in the following, more studies are required to fully explore the issues influencing wiki acceptance. The purpose of this paper is to investigate the factors which influence the attitudes of students towards the use of wikis. The findings of this study will contribute to research related to technology acceptance by validating an extended TAM and is expected to allow e-learning stakeholders to improve learning design and technology.

The rest of the paper is organized as follows: Firstly, the literature review, the hypotheses, the research methodology, the profile of the participants and the design of the wiki activity are presented. The following sections show the research results accompanied with the discussion of the results obtained. The last section presents the conclusions with the implications and limitations of the research.

Literature review

Technology Acceptance Model

The acceptance of specific technologies is explained by several theoretical models. Among them, the Technology Acceptance Model (TAM) is considered as a key, influential and robust, model to understand factors which influence the human behavior towards use (Marangunić & Granić, 2015, Marchewka, Liu, & Kostiwa, 2007). It is based on the theory of reasoned action (TRA, Ajzen & Fishbein, 1980). The theory aims to explain the relationship between attitudes and behavioral intentions and to subsequently predict how people will behave. The decision of an individual to engage in a particular behavior is based on the beliefs of a person in relation to the expected outcome. Therefore, if someone strongly believes that a system is useful, then it is more probable to use it. The factors which determine intention are attitudes and subjective norms.
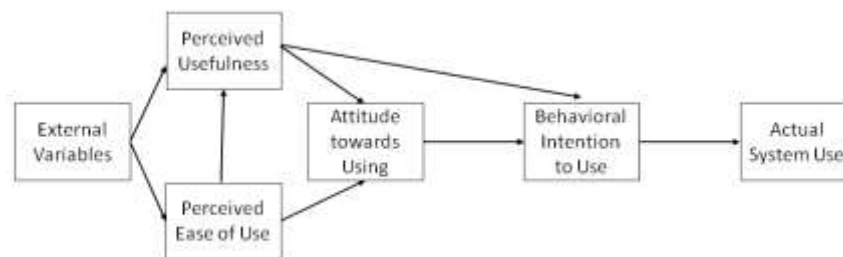

Figure 1: Technology acceptance model (Davis, 1989).

According to the TAM the factors that affect the acceptance of a system are perceived usefulness and perceived ease of use (Figure 1, Davis, 1989). Perceived usefulness refers to "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320). Perceived ease of use refers to "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p.320). Several studies adopted TAM to examine the acceptance of Web courses (Daskalakis, & Tselios, 2011, Ngai, Poon, & Chan, 2007; Tselios, Daskalakis, & Papadopoulou, 2011). The TAM has been also combined with factors from other models such as social influence and facilitating conditions to examine computers' acceptance (Teo, 2009; Teo & Van Schaik, 2009; Teo, Lee, & Chai, 2008) and computer based assessment acceptance (Terzis, Moridis, & Economides, 2012).

These two factors are included in another technology acceptance model, the Unified Theory of Acceptance and Use of Technology (UTAUT, Venkatesh, Morris, Davis, & Davis, 2003). The UTAUT intends to explain behavioral intentions by examining four key constructs: 1) performance expectancy, 2) effort expectancy, 3) social influence, and 4) facilitating conditions. Researchers adopted this model in order to assess the acceptance of learning management systems (Marchewka et al., 2007; Hsu, 2013).

Toh (2013) applied the UTAUT model to 144 secondary students and found that performance expectancy and facilitating conditions had an effect on behavioral intention to use wikis. Moreover, he added three other factors and regardless of the increased deviation, he found that two of them, namely trust and comfort level, had also an impact on behavioral intention. Moreover, Yueh, Huang and Chang (2015) investigated the factors which influence students' continued use of wikis, by applying an extended UTAUT model to 103 undergraduate students. They found was that effort expectancy affects the actual use of wikis. Furthermore, social influence and the actual use of wikis had a positive impact on the use by students, in the future.

Iglesias-Pradas, Hernández-García and Fernández-Cardador (2015) created another model based on social factors to investigate factors influencing wikis' use to share knowledge behaviors. The sample comprised 47 employees. The results revealed that behavioral intention, perceived critical mass and social anxiety affect knowledge acquisition and perceived critical mass affects knowledge creation. Finally, according to the reported results, behavioral intention was affected by attitudes towards collaborative knowledge sharing and social influence.

Moreover, an extended technology acceptance model was presented by Liu (2010) and it was based on three additional factors: wiki self-efficacy, online posting anxiety and perceived behavioral control. Participants were 126 undergraduate students. Wiki self-efficacy was found to have positive effect on perceived ease of use and on online posting anxiety, whereas the other new variables had no effect on other variables. However, perceived ease of use and perceived usefulness seemed to have effect on

behavioral intention to use wikis. In conclusion, another element that emerged was that perceived ease of use affected perceived usefulness and behavioral intention was related with wikis' actual use.

Kear et al. (2014), examined perceptions of students and tutors, in order to investigate the wiki's effectiveness in supporting student collaboration and tutors' marking. They used the main TAM factors and found that usefulness and ease of use were key factors to students' acceptance of the wiki and that social influence and intrinsic motivation were also important factors. Subsequently, usefulness was the most important factor in tutors' acceptance of the wiki, although were less well-received by tutors because of the increasing workload for their marking task. Also, Shen, Cheung & Lee (2013) used an information adoption model to 132 university students and investigated the factors that influence students to adopt information from Wikipedia. They found that usefulness and trust were the most important factors predicting this adoption.

Big Five personality characteristics and Technology Acceptance

Since personality affects someone's beliefs (Devaraj, Easley, & Crant, 2008), researchers have incorporated personality characteristics with TAM to examine acceptance of different systems. While there are different proposals in the literature to measure aspects of personality, the most widely accepted psychometric construct seems to be the five-factor model which has Extraversion, Agreeableness, Conscientiousness, Neuroticism and Openness to Experience as personality traits (Goldberg, Johnson, Eber, Hogan, Ashton, Cloninger, & Gough, 2006).

Devaraj et al. (2008) investigated the influence of Big-Five characteristics on the acceptance of a collaborative learning system. They found that the neuroticism associated negatively and significantly with perceived usefulness and that extraversion, agreeableness and conscientiousness moderates the relationship between subjective norms and intention to use technology. The characteristic of conscientiousness was found also to moderates the relationship between perceived usefulness and intention to use technology.

Rosen & Kluemper, (2008) investigated the impact of personality on the acceptance of a social networking technology. It was found that extraversion correlates significantly with perceived usefulness and perceived ease of use, while conscientiousness correlates significantly with perceived ease of use. Also, three out of five personality characteristics found to influence the intention to use an eLearning system (Punnoose, 2012). The most notable results were that conscientiousness and emotional stability have a significantly positive effect on subjective norms, extraversion relates positively and significantly with perceived ease of use and conscientiousness has a positively and significantly with perceived usefulness.

The present study applies to a model which is based on the technology acceptance model (TAM) and by using System Usability Scale (Brooke, 1996) to measure perceived use of use. Also, it incorporates two other variables, social norms and facilitating conditions, as it had been suggested by Venkatesh et al. (2003), and the big five personality characteristics.

In specific, the research goals were:

1) to test the validity of the proposed model
2) to examine the effects of the proposed factors on behavioral intention to use wikis
3) to investigate differences in students' conceptions, attitudes and beliefs before and after the actual use of the system.

Hypotheses development

Behavioral Intention (BI)

The aim of this study was to investigate the factors which affect the behavioral intention of students as far as the continuous use of wikis is concerned.

As discussed previously, the decision of a person to get involved in a particular behavior, is heavily influenced by the expected outcome which occurs as a result by performing the behavior. The individual's intention to carry out a behavior is affected by the attitude towards this behavior as well as the subjective norm (Sheppard, Hartwick, & Warshaw, 1988). Moreover, behavioral intention is affected by perceived usefulness (Davis, 1989).

Perceived Usefulness (PU)

A significant body of research identifies a relationship between perceived usefulness and behavioral intention to use a technology system (Davis, 1989; Liu, 2010; Punnoose, 2012; Rosen & Kluemper, 2008; Teo & Van Schaik, 2009; Tselios, Daskalakis, & Papadopoulou 2011). Thus, if a person believes that a system is beneficial for him or her, he or she is more likely to use this system. Moreover, perceived usefulness affects attitudes towards computers' use (Teo & Van Schaik, 2009). Therefore, the following hypotheses are constructed:

H1. Perceived usefulness has a significantly positive effect on wiki behavioral intention.

H2. Perceived usefulness has a significantly positive effect on students' wiki attitude.

Perceived Ease of Use (PEU)

Several studies demonstrated a relationship between perceived ease of use and perceived usefulness (Punnoose, 2012; Rosen & Kluemper, 2008; Teo & Van Schaik, 2009). Thus, if a person perceives that a system is usable, his perception of system's usefulness is positively affected. Thus:

H3. Perceived ease of use has a significantly positive effect on perceived usefulness.

H4. Perceived ease of use has a significantly positive effect on students' wiki attitude.

Attitude towards Use (AT)

Attitude is someone's perspective about performing a behavior. It may be positive or negative. Attitudes towards collaborative knowledge sharing affect the intention to use wikis (Iglesias-Pradas et al., 2015). In other words, students' intention to use wikis is shaped by their attitudes towards use. As a result, the following hypothesis is proposed:

H5. Students' wiki attitude has a significantly positive effect on wiki behavioral intention.

Facilitating Conditions (FC)

"Facilitating conditions are factors in the environment which exert an influence over a person's desire to perform a task" (Teo & Van Schaik, 2009, p. 51). As West and West (2009) mentioned, it is important to prepare students for wiki work. Teachers should create appropriate material, a sample wiki in which students could practice and manage the wiki process. Therefore, because of the wikis' open nature, it is crucial to examine influence of facilitating conditions (skills training, information or materials available and administrative support) on students' attitudes towards use and perceived ease of use. Teo and Van Schaik (2009) found that facilitating conditions affect the perceived ease of use. Pre-service teachers believe that technical support is important and helps them to see computers as easy to use. Moreover, facilitating conditions were found to have a significant positive effect on attitudes (Teo, 2009). Therefore:

H6. Facilitating conditions have a significantly positive effect on perceived ease of use.

H7. Facilitating conditions have a significantly positive effect on students' wiki attitude.

Social Norms (SN)

Social norms are rules of behavior considered appropriate by a group or society. As a result, it is more probable to use a system, if our surroundings believe that we should do so. Taking into consideration that wikis are collaborative writing tools, it is

important to investigate social norms and if they have an effect on perceived usefulness, facilitating conditions and the intention to use this technology. Not surprisingly, social norms seem to affect intention to use wikis (Iglesias-Pradas et al., 2015), have a significant effect on the perceived usefulness of the system (Punnoose, 2012) and on computer attitudes (Teo et al., 2008). Thus, the following hypotheses are proposed:

H8. Social norms have a significantly positive effect on perceived usefulness.

H9. Social norms have a significantly positive effect on students' wiki attitude.

H10. Social norms have a significantly positive effect on behavioral intention to use wiki.

Big Five characteristics: Openness to Experience (OP)

Openness to experience involves being curious, creative and intelligent (Barrick & Mount, 1991). Previous works illustrated that it does not present any significant positive association with the perceived usefulness (Devaraj et al., 2008; Özbek, Alnıaçık, Koc, Akkılıç , & Kaş, 2014; Rosen & Kluemper, 2008; Terzis et al., 2012). Instead, it is noteworthy that it has a positive and considerable correlation with the perceived ease of use (Özbek et al., 2014). Since these students are characterized by increased levels of curiosity, they might have already used such technologies thus finding them as easier to use (Orfanou, Tselios, & Katsanos, 2015). Thus:

H11. Openness to experience has a significantly positive effect on perceived ease of use.

Big Five characteristics: Conscientiousness (CS)

Conscientiousness characterizes people who are well organized, responsible, efficient and prefer planned behavior (Barrick & Mount, 1991). Devaraj et al., (2008) found that conscientiousness moderates the relation between perceived usefulness and behavioral intention as well as the relation between subjective norms and behavioral intention. Conscientiousness did not have a significant effect on perceived usefulness (Özbek et al., 2014; Terzis et al., 2012). However, such an effect was detected on perceived ease of use (Rosen & Kluemper, 2008; Terzis et al., 2012). Thus:

H12. Conscientiousness has a significantly positive effect on perceived ease of use.

Big Five characteristics: Extraversion (EX)

Extroverted people are considered to be sociable, talkative and active (Barrick & Mount, 1991). Extraversion moderates the relation between subjective norms and behavioral intention in order to use a collaborative technology (Devaraj et al., 2008).

Researchers did not find a significant correlation between extraversion and perceived usefulness (Özbek et al., 2014; Terzis et al., 2012). However, people with high degree of extraversion tend to perceive a system by the ease of use (Punnoose, 2012; Rosen & Kluemper, 2008). Therefore:

H13. Extraversion has a significantly positive effect on perceived ease of use.

Big Five characteristics: Agreeableness (AG)

Agreeableness includes people who are good-natured, friendly and compassionate (Barrick & Mount, 1991). Agreeableness moderates the relation between subjective norms and behavioral intention (Devaraj et al., 2008) but has not a significant effect on perceived usefulness (Özbek et al., 2014; Rosen & Kluemper, 2008). However, a positive and significant correlation was found between agreeableness and the perceived ease of use (Özbek et al., 2014; Terzis et al., 2012). Thus, agreeable individuals tend to perceive systems as more usable.

H14. Agreeableness has a significantly positive effect on perceived ease of use.

Big Five characteristics: Emotional Stability (ES)

The attributes which are included in this factor, are related with depression, anger and anxiety (Barrick & Mount, 1991). No significant correlation was found between neuroticism and perceived ease of use (Özbek et al., 2014; Rosen & Kluemper, 2008; Terzis et al., 2012). In addition, emotional stability is related positively and significantly with subjective norms. Emotionally stable persons tend to accept opinions of those who feel close to them (Punnoose, 2012) because in contrast with neurotic students, they might have positive reactions which can facilitate social interaction. As a result, the following hypothesis is proposed:

H15. Emotional stability has a significantly positive effect on social norms.

Research method

The research framework of the study was based on the TAM model (Davis, 1989), and on factors from the UTAUT model (Venkatesh et al., 2003). A one-group pretest–posttest design was adopted (Oncu & Cakir, 2011). The participants were students who were attending a non-compulsory academic course, entitled "Introduction to Web Science". The study took place from 11 May 2016 to 24 May 2016, a period during which the students had to complete the activity. Participation in the activity was compulsory. Students participated voluntarily in the research and the online questionnaires were given only to those who agreed to participate. Students participated anonymously, could decide not to answer all of the questions and withdraw from the study at any time. The model was examined both in pre and post

scenarios in order to monitor any changes on research hypotheses during the progress of the wiki activity.

Description of the activity

The design of each activity was based on the framework proposed by West and West (2009). Moreover, students were divided into groups. Each group comprised 5 members and each member had a specific role (West & West, 2009, see also Altanopoulou et al., 2015 for more details). The subject of the graded activity was related to the usability evaluation techniques. The students had to study and present the most widely adopted usability evaluation techniques and basic definitions about human computer interaction and user interface design. In addition, they had to cooperatively evaluate a web site, using the heuristic rules (Nielsen, 1994).

Survey instrument

The questions which were related to personality characteristics (Big Five Personality Factors) were measured by using the International Personality Item Pool (Goldberg et al., 2006). The Perceived Ease of Use was measured by using the System Usability Scale (SUS) (Brooke, 1996) which comprises 10 questions translated in Greek (Katsanos, Tselios, & Xenos, 2012, Orfanou, Tselios, & Katsanos, 2015). As mentioned by Lewis and Sauro (2009), the System Usability Scale (SUS) comprises 2 factors: Usability and Learnability. The Usability factor has 8 items while Learnability has 2 items. In this survey, the SUS was used in order to measure perceived ease of use (Usability). This differentiation is observed both in pre-wiki and post-wiki scenario since items 4 and 10 which measure Learnability had low loadings. Thus, they were subsequently excluded from the study. Only in the pre-wiki scenario another item (item 6) had low loading. Possibly, due to the fact that students did not actually use wiki technology at the moment.

The remaining 20 items were adopted from previous studies with modifications to confront to the context of wiki activity. The items were distributed into 5 groups of factors which are: *perceived usefulness* (Davis as cited in Legris, Ingham, & Collerette, 2003, pp. 197-198), *facilitating conditions* (as cited in Teo, 2010), behavioral intention (based on Tselios, Daskalakis, & Papadopoulou, 2011), *social norms* (self-developed, based on Punnose, 2012, pp. 331) and *attitude towards use* (as cited in Venkatesh et al., 2003, pp. 456) with a 5-point scale ranging from 1 "strongly disagree" to 5 "strongly agree". In addition, the first questionnaire contained demographic items, such as year of study, age, gender and skills in using specific ICT applications. All the items were translated from English into Greek.

Results

Partial Least Squares analysis

Both scenarios were analyzed using Partial Least Squares (PLS) path modeling. The major feature of PLS is its ability to analyze relationship models with latent variables, while its major advantage is the absence of strict requirements regarding sample size (Chin, 1998). PLS is composed of the measurement model which shows how the latent variables are measured and contains individual item loadings, construct reliability, convergent validity and discriminant validity and the structural model which represents the relationships between the latent variables and their significance (Hair, Hult, Ringle, & Sarstedt, 2014).

Demographics

A convenience sampling was applied. 106 students were enrolled in the course. The participants for the pre-wiki TAM scenario were 85 (84 female, 1 male, aged 18-33, with a mean age of 20.31). As for the post-wiki TAM scenario, a total of 86 students (85 female, 1 male) participated, aged 18-33 with a mean age of 20.36 years.

Pre-Wiki TAM Scenario

Measurement model
The individual item loadings are presented in Table 1. Low values (lower than 0.6) were excluded of the study because an increase of composite reliability was found (Hair et al., 2014).

Table 1. Individual loadings. (AG= agreeableness, AT= attitude towards use, BI= behavioral intention, CS= conscientiousness, ES= emotional stability, EX= extraversion, OP=openness, PU= perceived usefulness, PEU= perceived ease of use, SN= social norms, FC= facilitating conditions).

Item Loadings	Value	Item Loadings	Value
PU1	0.847	SN1	0.888
PU3	0.812	SN2	0.870
PU4	0.702	SN3	0.874
PU5	0.843	FC1	0.818
PEU1	0.780	FC2	0.804
PEU2	0.729	FC3	0.779
PEU3	0.708	FC4	0.670
PEU5	0.760	ES2	0.670
PEU7	0.676	ES7	0.810
PEU8	0.684	ES8	0.658
PEU9	0.750	CS1	0.690
AT1	0.899	CS2	0.627
AT2	0.753	CS4	0.635
AT3	0.871	CS5	0.641
AT4	0.862	CS7	0.677

BI1	0.872	CS8	0.705
BI2	0.861	CS9	0.807
BI3	0.777	CS10	0.757
AG2	0.803	EX3	0.633
AG4	0.842	EX4	0.741
AG7	0.698	EX8	0.879
AG8	0.678	OP2	0.889
AG9	0.834	OP4	0.800

Construct reliability has been assessed by using Cronbach's alpha and composite reliability (Roldán & Leal, 2003). Ideally, Cronbach's alpha should be greater than 0.7 (Nunnally & Bernstein, 1994). All values are over 0.7, except of extraversion (0.629), emotional stability (0.615) and openness (0.607, see Table 2) which were considered satisfactory since "Cronbach's alpha is sensitive to the number of items in the scale and generally tends to underestimate the internal consistency reliability" (Hair et al., 2014, p. 101). According to Hair et al. (2014, p. 124), composite reliability should be ranging over 0.708. To sum up, all constructs had produced values greater than 0.708.

Convergent validity was assessed in relation to values of the Average Variance Extracted (AVE). As proposed by Hair et al. (2014), AVE should be greater than 0.5. In terms of convergent validity, all items had produced values greater than 0.5 with the exception of conscientiousness (0.483).

Table 2. Reliability and convergent Validity

Construct	Cronbach's Alpha (α)	Composite Reliability	AVE
Agreeableness (AG)	0.841	0.881	0.599
Attitude towards Use (AT)	0.868	0.911	0.719
Behavioral Intention (BI)	0.786	0.876	0.702
Conscientiousness (CS)	0.851	0.881	0.483
Extraversion (EX)	0.629	0.799	0.574
Facilitating Conditions (FC)	0.776	0.853	0.593
Emotional Stability (ES)	0.615	0.758	0.513
Openness (OP)	0.607	0.833	0.715
Perceived Ease of Use (PEU)	0.856	0.887	0.530
Perceived Usefulness (PU)	0.814	0.879	0.645
Social Norms (SN)	0.851	0.909	0.770

The discriminant validity was assessed by Fornell and Larcker (1981) "criterion" and with the Heterotrait-Monotrait Ratio (HTMT, Henseler, Ringle, & Sarstedt, 2015). All the constructs for the Fornell and Larcker criterion had values ranging over 0.7, except of conscientiousness (see Table 3).

Table 3. Discriminant Validity

	AG	AT	BI	CS	EX	FC	ES	OP	PEU	PU	SN
AG	0.774										
AT	0.072	0.848									
BI	0.138	0.653	0.838								
CS	0.212	0.236	0.224	0.695							
EX	0.005	-0.095	-0.195	-0.184	0.758						
FC	0.263	0.501	0.497	0.205	-0.073	0.770					
ES	0.066	0.253	0.208	0.144	-0.023	0.391	0.716				
OP	0.010	-0.185	-0.180	0.114	0.126	-0.081	0.100	0.845			
PEU	0.200	0.620	0.604	0.212	-0.260	0.551	0.216	-0.192	0.728		
PU	0.074	0.646	0.658	0.157	-0.078	0.534	0.177	-0.204	0.704	0.803	
SN	0.079	0.581	0.709	0.065	-0.011	0.511	0.180	0.004	0.516	0.603	0.877

As far as the Heterotrait- Monotrait Ratio (HTMT) is concerned all the values were ranging under 0.9 (Table 4). All the constructs had satisfactory values for the upper confidence interval in the bootstrapping results of the HTMT. Therefore, discriminant validity was established.

Table 4. Discriminant Validity (HTMT)

	AG	AT	BI	CS	EX	FC	ES	OP	PEU	PU	SN
AG											
AT	0.179										
BI	0.266	0.783									
CS	0.261	0.270	0.246								
EX	0.152	0.175	0.266	0.364							
FC	0.307	0.592	0.621	0.235	0.166						
ES	0.174	0.340	0.233	0.416	0.304	0.524					
OP	0.141	0.255	0.235	0.190	0.321	0.240	0.178				
PEU	0.225	0.664	0.672	0.247	0.359	0.593	0.317	0.271			
PU	0.158	0.761	0.823	0.214	0.176	0.635	0.234	0.282	0.784		
SN	0.117	0.671	0.866	0.173	0.058	0.633	0.187	0.222	0.541	0.724	

Structural Model

For the structural model, a bootstrapping technique was applied (500 resamples, Chin, 1998; Gefen, Straub, & Boudreau, 2000, p.27). This is a replacement technique in which 500 subsamples from the original data are picked and the model is estimated for each subsample (Hair et al., 2014). The examination of the t-values was based on a two-tail test with significance levels of $p<0.05$, $p<0.01$ and $p<0.001$. Perceived ease of use is associated with a very strong significant relationship with perceived

usefulness (H3 at p<0.001, Figure 2). The relationship between facilitating conditions and perceived ease of use, social norms and behavioral intention and social norms and perceived usefulness were confirmed with high significance as well (p<0.001). In addition, the relationship between perceived ease of use and attitudes towards use had a positive correlation with significance at p<0.01 level.

The relationship between perceived usefulness and behavioral intention, attitudes towards use and behavioral intention and perceived usefulness and attitudes towards use were confirmed with significance at p<0.05 level. Also, the relationship between extraversion and perceived ease of use has a significant correlation to the opposite direction at p<0.05 level. The relationship between social norms and attitudes towards use had a correlation at p=0.053< 0.1 level.

The relationship between facilitating conditions and attitudes towards use, emotional stability and social norms and characteristics of agreeableness, conscientiousness and openness with perceived ease of use did not have a significant correlation.

Post-Wiki TAM Scenario

Measurement model
The individual item loadings are presented in Table 5. Low values (lower than 0.6) were excluded from the study since an increase of composite reliability was found (Hair et al., 2014).

Table 5. Individual loadings

Item Loadings	Value	Item Loadings	Value
PU1	0.906	SN2	0.935
PU3	0.877	SN3	0.904
PU4	0.742	FC1	0.826
PU5	0.892	FC2	0.879
PEU1	0.747	FC3	0.735
PEU2	0.785	FC4	0.799
PEU3	0.835	ES5	0.693
PEU5	0.675	ES7	0.683
PEU6	0.706	ES8	0.691
PEU7	0.675	ES9	0.718
PEU8	0.755	CS2	0.771
PEU9	0.761	CS4	0.672
AT1	0.891	CS7	0.682
AT2	0.849	CS8	0.869
AT3	0.874	EX1	0.732

AT4	0.917	EX5	0.738
BI1	0.863	EX7	0.877
BI2	0.835	EX9	0.657
BI3	0.832	OP3	0.755
AG3	0.851	OP5	0.806
AG4	0.658	OP7	0.606
AG5	0.785	OP8	0.604
AG8	0.663	OP10	0.820
SN1	0.887		

Regarding the construct reliability, it has been assessed in terms of Cronbach's alpha and composite reliability (Roldán & Leal, 2003). All values are ranging over 0.7, apart from emotional stability (0.656, Table 6), which is also considered adequate. As far as composite reliability is concerned, all constructs produced values greater than 0.708. In terms of convergent validity, all items produced values greater than 0.5 except for emotional stability (0.485) which was also considered satisfactory.

Table 6. Reliability and convergent Validity

Construct	Cronbach's Alpha (α)	Composite Reliability	AVE
Agreeableness (AG)	0.760	0.830	0.553
Attitude towards Use (AT)	0.906	0.934	0.780
Behavioral Intention (BI)	0.798	0.881	0.712
Conscientiousness (CS)	0.775	0.838	0.566
Extraversion (EX)	0.750	0.840	0.571
Facilitating Conditions (FC)	0.828	0.885	0.658
Emotional Stability (ES)	0.656	0.790	0.485
Openness (OP)	0.766	0.844	0.525
Perceived Ease of Use (PEU)	0.886	0.908	0.554
Perceived Usefulness (PU)	0.878	0.917	0.734
Social Norms (SN)	0.895	0.934	0.826

The Fornell and Larcker criterion had satisfactory values for the post-wiki scenario (see Table 7).

Table 7. Discriminant Validity

	AG	AT	BI	CS	EX	FC	ES	OP	PEU	PU	SN
AG	0.744										
AT	0.100	0.883									
BI	0.214	0.751	0.844								

	AG	AT	BI	CS	EX	FC	ES	OP	PEU	PU	SN
CS	0.407	0.218	0.257	0.753							
EX	0.066	-0.119	-0.191	-0.179	0.755						
FC	0.014	0.496	0.451	0.036	-0.111	0.811					
ES	0.047	0.126	0.141	0.191	0.005	-0.050	0.696				
OP	0.081	-0.199	-0.220	-0.201	0.503	-0.121	-0.138	0.724			
PEU	0.287	0.642	0.727	0.290	-0.310	0.430	0.020	-0.297	0.744		
PU	0.223	0.741	0.715	0.268	-0.164	0.504	0.011	-0.246	0.707	0.857	
SN	0.042	0.649	0.722	0.143	-0.076	0.341	0.241	-0.189	0.549	0.607	0.909

In the Heterotrait-Monotrait Ratio (HTMT) all the values were ranging below 0.9 (Table 8). All the constructs had satisfactory values for the upper confidence interval in the bootstrapping results for the HTMT. Consequently, discriminant validity was established.

Table 8. Discriminant Validity (HTMT)

	AG	AT	BI	CS	EX	FC	ES	OP	PEU	PU	SN
AG											
AT	0.180										
BI	0.276	0.880									
CS	0.392	0.265	0.278								
EX	0.255	0.148	0.243	0.207							
FC	0.224	0.554	0.539	0.119	0.169						
ES	0.165	0.223	0.226	0.328	0.172	0.188					
OP	0.213	0.249	0.277	0.347	0.677	0.181	0.294				
PEU	0.387	0.678	0.819	0.276	0.358	0.459	0.185	0.348			
PU	0.246	0.826	0.840	0.272	0.201	0.581	0.095	0.305	0.749		
SN	0.150	0.718	0.846	0.151	0.169	0.377	0.304	0.226	0.577	0.678	

Structural Model

Results for the structural model are presented in Figure 3. The majority of the hypotheses was confirmed. Specifically, the perceived ease of use is associated with a very strong significant relationship with perceived usefulness (H3 at $p<0.001$). The relationship between facilitating conditions and perceived ease of use and social norms and behavioral intention were validated with high importance as well ($p<0.001$).

The relationships between social norms and perceived usefulness, attitudes towards use and behavioral intention and perceived usefulness and attitudes towards use, were demonstrated ($p<0.01$). The relationships between agreeableness and perceived ease of use, facilitating conditions and attitudes towards use, social norms and attitude towards use, perceived usefulness and behavioral intention and emotional stability and social norms, were verified ($p<0.05$). Also, the relationship between extraversion

and perceived ease of use has a significant negative correlation (p<0.05). The relationships between perceived ease of use and attitude towards use and characteristics of conscientiousness and openness with perceived ease of use, were not confirmed.
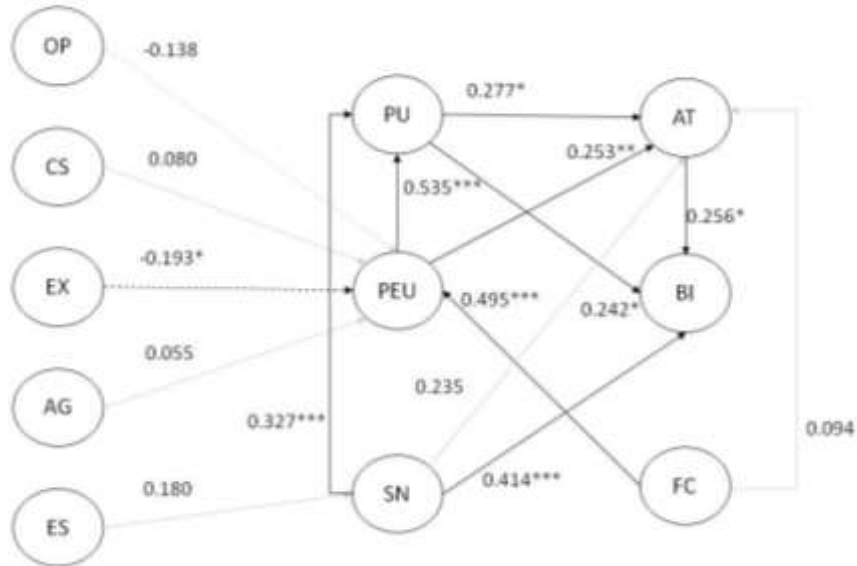

Figure 2: S*t*ructural Model (*pre*-wiki scenario). Notes:*p < 0.05, **p < 0.01, *** p < 0.001, black arrows indicate a significant path, grey arrows indicate a non-significant path, dotted arrows indicate a negative path while solid arrows indicate a positive path.
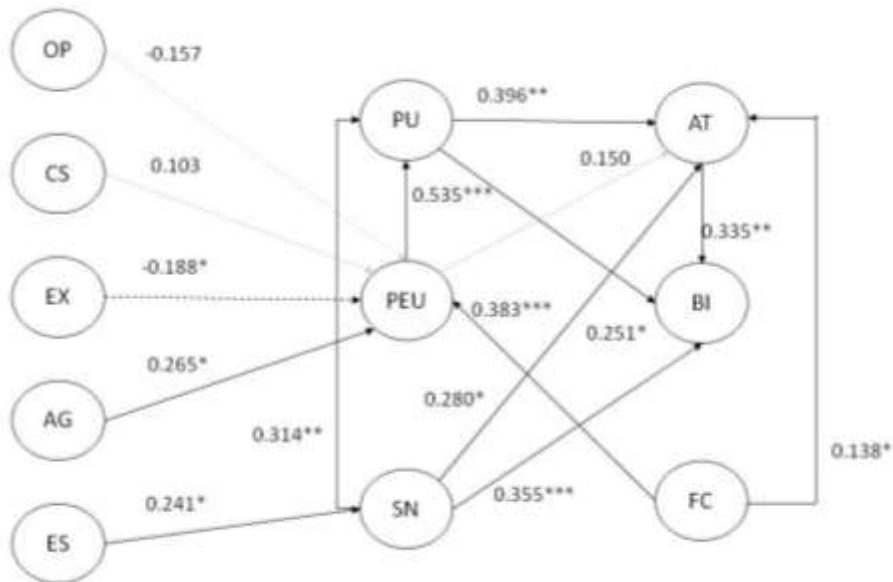

Figure 3: Structural Model (post-wiki scenario)

Comparative analysis

Some similarities and some differences have been emerged between the scenarios. For the convergent validity, the AVE of conscientiousness for the pre-wiki scenario produced a low value, whereas for the post scenario emotional stability, produced a low value. However, the results for discriminant validity are considered satisfactory in both scenarios. As far as the structural model is concerned, observations were deduced in relation to the similarities and differences which came up from the results obtained from the two scenarios (see Figures 2, 3 and Table 9).

Table 9. Comparative Analysis

		Original sample		t-statistics		P value		Supported	
		Pre-wiki	Post-wiki	Pre-wiki	Post-wiki	Pre-wiki	Post-wiki	Pre-wiki	Post-wiki
1	PU-BI	0.242	0.251	2.235	2.546	0.026	0.011	**Yes**	**Yes**
2	PU-AT	0.277	0.396	2.361	2.634	0.019	0.009	**Yes**	**Yes**
3	PEU-PU	0.535	0.535	6.247	6.490	0.000	0.000	**Yes**	**Yes**
4	PEU-AT	0.253	0.150	2.580	1.302	0.010	0.193	**Yes**	No
5	AT-BI	0.256	0.335	2.424	3.116	0.016	0.002	**Yes**	**Yes**
6	FC-PEU	0.495	0.383	5.581	5.325	0.000	0.000	**Yes**	**Yes**
7	FC-AT	0.094	0.138	0.828	2.085	0.408	0.038	No	**Yes**
8	SN-PU	0.327	0.314	5.073	3.026	0.000	0.003	**Yes**	**Yes**
9	SN-AT	0.235	0.280	1.940	2.255	0.053	0.025	No	**Yes**
10	SN-BI	0.414	0.355	4.630	4.275	0.000	0.000	**Yes**	**Yes**
11	OP-PEU	-0.138	-0.157	1.331	1.362	0.184	0.174	No	No
12	CS-PEU	0.080	0.103	0.741	1.005	0.459	0.315	No	No
13	EX-PEU	-0.193	-0.188	2.123	2.033	0.034	0.043	No	No
14	AG-PEU	0.055	0.265	0.748	2.488	0.455	0.013	No	**Yes**
15	ES-SN	0.180	0.241	0.917	2.396	0.359	0.017	No	**Yes**

All in all, 8 out of the 15 hypotheses were confirmed for the pre-wiki scenario and 11 out of 15 for the post-wiki scenario (Table 9). For both scenarios perceived usefulness had a significantly positive effect on wiki behavioral intention and on students' wiki attitude (H1: pre-wiki $p<0.05$, post-wiki $p< 0.05$ H2: pre-wiki $p<0.01$, post-wiki $p< 0.05$). Perceived ease of use had a significantly positive effect on perceived usefulness for both scenarios (H3: pre- and post-wiki $p<0.01$), whereas perceived ease of use had a significantly positive effect on students' wiki attitude only in the pre-wiki scenario (H4: pre-wiki $p<0.05$, post-wiki, ns). Students' wiki attitude had a significantly positive effect on wiki behavioral intention for both scenarios (H5: pre-wiki $p<0.05$, post-wiki $p<0.01$). Such a finding stresses the ascertainment that if students have an overall positive view of the system, then in turn they intent to use it.

Facilitating conditions had a significantly positive effect on perceived ease of use for both scenarios (H6: pre- and post-wiki $p<0.01$) but a significantly positive effect on students' wiki attitude was found only in post-wiki scenario (H7: pre-wiki ns, post-

wiki, p<0.05). Social norms had a significantly positive effect on perceived usefulness (H8: pre-wiki p<0.05, post-wiki, p<0.01) and on wiki behavioral intention for both scenarios (H10: pre-wiki p<0.01, post-wiki, p<0.01), but a significantly positive effect on students' wiki attitude was found in post-wiki scenario (H9: pre-wiki ns, post-wiki, p<0.05). Openness to experience and conscientiousness had not a significantly positive effect on perceived ease of use (H11, H12) and these two hypotheses were not supported for both scenarios. Moreover, extraversion had a significantly negative effect on perceived ease of use (H13: pre-wiki p<0.05, post-wiki p<0.05). Agreeableness had a significantly positive effect on perceived ease of use only in post-wiki scenario (H14: pre-wiki ns, post-wiki p<0.01). Finally, emotional stability had a significantly positive effect on social norms only in post-wiki scenario (H14: pre-wiki ns, post-wiki p<0.05).

In terms of predictive strength, the pre-wiki scenario gave a value of 0.621 for the R^2 of behavioral intention and for the post-wiki scenario, R^2 was found to be 0.688, thus explaining 68.8% of the variance in behavioral intention. The remaining R-squared values for the other constructs are shown in Table 10.

Table 10. R-squared values for both scenarios

Construct	R^2 Pre-Wiki	R^2 Post-Wiki
Behavioral Intention (BI)	0.621	0.688
Perceived Usefulness (PU)	0.573	0.569
Perceived Ease of Use (PEU)	0.377	0.375
Attitude towards Use (AT)	0.519	0.639
Social Norms (SN)	0.032	0.058

Discussion

This paper reports wiki acceptance before and after actual use in the context of an organized activity given to students of an Educational Department. Contrary to other related studies this study extended TAM by including factors such as facilitating conditions, social norms and the big five personality characteristics. Moreover, SUS has been adopted which is considered the most appropriate questionnaire to measure perceived ease of use (Brooke 1996, Orfanou, Tselios, & Katsanos, 2015).

Most of the relationships were confirmed. In line with other studies, the relationship between perceived ease of use and perceived usefulness was of the highest magnitude (Daskalakis, & Tselios, 2011; Punnoose, 2012; Rosen & Kluemper, 2008; Teo & Van Schaik, 2009). Thus, if a student perceives wikis as usable, it would be more likely to find it useful too. Furthermore, perceived usefulness and attitudes towards use had a significant effect on behavioral intention, thus increasing the adoption probability by

the students. Also, perceived usefulness influenced attitudes towards use, but perceived ease of use influenced attitudes towards use only in the pre-wiki scenario.

In addition, the relationship between facilitating conditions and perceived ease of use was string, which is aligned with outcomes of other researchers (Teo & Van Schaik, 2009). Thus, facilitating conditions influence the perceived wikis' usability. In a similar vein, facilitating conditions influence attitudes towards use only in the post-wiki scenario. The effect of social norms on perceived usefulness was very important, in accordance with Punnoose's study (2012). Moreover, social norms influenced behavioral intention significantly, similarly to a study by Iglesias-Pradas et al. (2015) but contrary to another (Teo & Van Schaik, 2009). However, social norms influenced students' attitudes towards use only in the post-wiki scenario. Specifically, students' social environment influences perceived usefulness, behavioral intention and attitudes regarding the use of wikis.

As far as the personality characteristics are concerned, agreeableness influenced perceived ease of use in the post-wiki scenario. This means that wiki adoption could be more beneficial for agreeable individuals . This result confirms evidence reported by Terzis et al., (2012). Also, in the post-wiki scenario emotional stability influenced social norms. Thus, emotionally stable individuals are expected to widespread positive attitudes towards wiki adoption (Punnoose, 2012). Extraversion had a significantly negative correlation with perceived ease of use. This contrasts other studies (Punnoose, 2012; Rosen & Kluemper, 2008) where a significant but positive correlation between these two variables emerges. Since negative correlation has been reported between academic performance and extraversion (Altanopoulou, & Tselios, 2015) but positive between ease of use and academic performance (Al-Rahmi et al., 2014) this could constitute an early sign of poor performance in wiki-mediated activities for extroverts.

In only two cases a statistically significant association was not established both in pre-wiki scenario and post-wiki scenario: between (a) conscientiousness and perceived ease of use and (b) openness and perceived ease of use. This was also reported by Barnett, Pearson, Pearson, & Kellermanns (2015).

Conclusion

The aim of this study is to investigate the factors which influence the behavior of students towards the use of wikis as well as any differences before and after the completion of the wiki activity. The analysis indicated that eight and eleven hypotheses were confirmed for the pre-wiki and post-wiki scenario, respectively. The model explains about 68.8% of the variance of behavioral intention to use wikis for the post-wiki scenario, which is significantly higher than the original TAM (Legris et al., 2003).

Findings from such studies could shed light on the investigation of the factors influencing educational technology acceptance in general and wikis in particular. Consideration of these factors could lead to more engaging wiki mediated activities, which, in turn, is expected to increase students' adoption and increased educational outcomes. Taking into consideration the post-wiki scenario, there are some useful implications for educators regarding the factors that increase wikis' acceptance. Firstly, in order to raise students' intention to use wikis, teachers should increase students' perceptions that wikis are useful for studying and create positive attitudes towards use and positive perceptions among important individuals.

Educators should aim to increase students' perceptions that wikis are easy to use and communicate positive perceptions among important individuals. Moreover, teachers should provide facilitating conditions when they apply wiki-mediated activities because these significantly affect wikis' perceived usability. Teachers should increase their perceptions that wikis are useful for studying, to positively influence students' attitudes towards wiki use. Towards this end, positive perceptions among important individuals and facilitating conditions are also expected to improve students' attitudes.

Furthermore, since wiki activities are collaborative, information about personality characteristics could provide useful insight to form more effective and compatible groups to increase students' perceived ease of use and positive perceptions among important individuals. Specifically, it is suggested that an effective group should not comprise too many students with high degree of extraversion because they tend to perceive that wikis are not easy to use. Moreover, students with high degree of agreeableness and emotional stability should be evenly distributed across the groups, since they tend to perceive that wikis are easy to use and tend to shift norms towards more positive attitudes towards them, respectively.

The current study is not without limitations. The compulsory nature of the activity, which was the last in the context of the course, may have influenced the perceptions of students. Also, since the wiki technology enables but also requires cooperation, it is quite possible ineffective collaboration to influence the opinions of students in post-wiki scenario. Finally, the sample of students comprised women, who enrolled in an Educational Science department.

Further studies, involving additional factors such as self-efficacy, actual use and tutor perceived quality, could be conducted in order to investigate the factors which influence the behavioral intention to use wiki technology. Moreover, there is a need of more balanced samples by including more male students of different ages and in different educational settings. Also, it will be of great interest to closely examine students' interactions while they use wiki technology and how these interactions affect students' attitudes and intention to use this technology in the future (Lee, Cho, Gay, Davidson, & Ingraffea, 2003). A deeper understanding of all learners' personal

cognitive strategies or information processing behaviors is required in order to provide a suitable information architecture that promotes the students' adoption as well as the learning process (Tselios, & Avouris, 2003). In addition, future studies will include questions to measure students' collaboration satisfaction.

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