

2008

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Recommended Citation

Lee, Velma and Lin, Shin-jeng, "Podcasting Acceptance on Campus: An extension of the UTAUT Model" (2008). *DIGIT 2008 Proceedings*. 3.

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PODCASTING ACCEPTANCE ON CAMPUS: AN EXTENSION OF THE UTAUT MODEL

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Abstract

This research developed and empirically tested a theoretical model on the acceptance of podcasting in the context of learning in higher education. The model integrated key variables from the TAM and UTAUT model, hypothesized and tested the effects of their antecedents found in literature concerning technology acceptance in higher education. The result confirmed the effects of UTAUT's four key antecedents on behavioral intention (intention to use): facilitating conditions, social influence, performance expectancy, and effort expectancy. Our findings suggest that facilitating factors pertinent to podcasting include technical support and copyright clearance. The inter-relationships among the four UTAUT antecedents are explicitly specified and relevant antecedents for podcasting are proposed and tested. The overall results are expected to contribute to theoretical development and industry practitioner in promoting the acceptance of podcasting in classrooms.

Keywords: UTAUT, TAM, podcasting, escalation of commitment, technology acceptance, technology adoption

Introduction

Different pedagogies have been used throughout history to train the next generation of leaders. Books were created to capture knowledge on print (Avrin, 1991) and online games (Godwin-Jones, 2005) were developed to provide experiential learning experience (Kolb, 1984). Podcasting has started becoming popular in business (Gronstedt, 2007), personal and educational (e.g. i-Tunes University) domains (Molina, 2006).

A podcast is a digital media file distributed over the Internet for playback on either portable media (mp3) players or personal computers. A podcast can be in video or audio format; subscribed to or automatically downloaded using free software such as iTunes. The initial appeal of podcasting was to allow individuals to distribute their own radio-style shows, but the system quickly became used in a wide variety of ways, including distribution of church sermons, college lectures, etc. In higher education, podcasts enable students and teachers to share information without geographical or temporal limitation. Students can download the podcast of a recorded lesson for repeated

learning. It can be a tool for communicating curriculum, assignments and information with parents, alumni and the community. A podcast can be thought of as a radio clip (personal interview with Apple Computer Senior Engineer, Rick Bettencourt, 2/15/08). A web site is required to host it. Technically, it is media-file based (MPEG-4) with extensions such as .m4a, m4b, .m4v and RSS Feed. In general, students need to access a website to view a podcast. They have the option to replay or stop the file at any time anywhere. Audio files (without images) can be listened to using a computer, MP3 player or iPod.

Research on podcasting began in 2005. It is still at an infancy stage. Bongey et al. (2006) conducted a research over 200 Biology students taking an undergraduate class and found podcasts availability in classes did not encourage student absence. Rather, the availability of podcasts presented positive effect for teaching and learning by complementing education in the traditional classroom setting. Recent research in podcasts covered the public sector government documents (Library Hi Tech 2008), use of podcasts in marketing (Hathi, 2008) and advertising (Haygood, 2007) but no new research regarding podcasts has been conducted for the higher education sector. Despite the potentials and importance of podcasting to teaching and learning, few studies examined the key factors that facilitate podcast acceptance within the classroom environment.

Literature Review and Research Objectives

The primary objective of this study is to propose and test a theoretical model regarding the key factors that are important to the acceptance of podcast in an educational setting. The literature review inspired the project to form the following three research objectives,

Reexamine the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Vankatesh et al. 2003). The UTAUT (Vankatesh et al, 2003) and TAM (Davis, 1989) models have been applied to study the technology for support higher educations, including Web-based course management system (Martins and Kellermanns, 2004), PowerPoint presentation (Hu, Clark and Ma, 2003), Web-based learning (Chiu and Wang, 2008). Moreover, UTAUT was tested and found to outperform eight well-known models for assessing the likelihood of success for new technology introduction. These two facts together seem to suggest that UTAUT would be appropriate to study the acceptance of podcasting in a higher education setting as well.

The formulation of UTAUT is not completely independent of the individual models. Among the eight models reviewed, TAM carried the most equivalent constructs in comparison with the UTAUT model. The main dependent variables in the UTAUT model are behavioral intention and use behavior. These antecedents bear an impact on *behavioral intention* (BI) which is similar to the *intention to use* (IU) construct put forth in Davis's (1989) TAM model. The main antecedents to "behavioral intention" include *performance expectancy* (PE), *effort expectancy* (EE), *social influence* (SI), and *facilitating conditions* (FC). PE and EE closely resemble the *perceived usefulness* (PU) and *perceived ease of use constructs* (PEOU) in TAM. SI includes one of the most studied external variables to TAM, social norms. However, UTAUT presented these four antecedents without specifying their inter-relationships while TAM and its various extension models showed more explicit and specific casual relationships among these constructs. Thus, the first objective of the study is to reexamine the relationships among the four antecedents in UTAUT by realigning the antecedents in the UTAUT model, as shown in Figure 1. The relationships among these constructs will be further explained in the research model and hypotheses section.

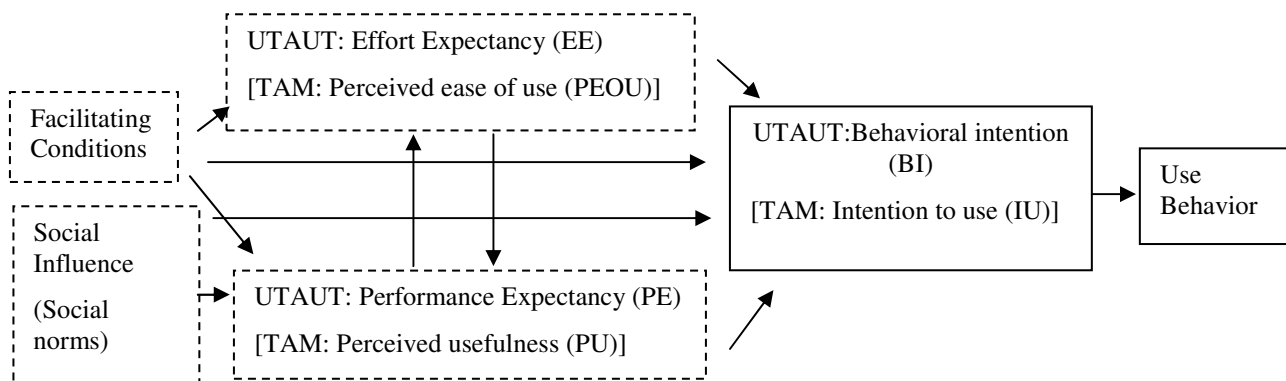


Figure 1. First-level Modification to UTAUT model based on TAM (excluding the moderating variables, gender, age, experience and voluntariness of use)

Operationalise the *Facilitating Conditions* in the UTAUT model. Vankatesh et al. (2003) found limited impact of *facilitating conditions* on the UTAUT model. We believed facilitating factors could bear a significant impact on behavioral intention if the appropriate dimensions are identified for operationalization. We, therefore, reviewed relevant literature of TAM applied in the educational context and proposed the adoption of pertinent dimensions for operationalising *facilitating conditions* using podcasting. Taking into consideration the nature of podcasts and its (relative) newness in the field, we proposed two dimensions for operationalization of the facilitating conditions in UTAUT model.

Theoretical extension of UTAUT. A relevant construct identified for introduction to the UTAUT was escalation of commitment (Staw, 1976). Escalation of commitment refers to the additional time and effort invested toward a previously committed goal. The additional spent could be a means to prove that one's prior decision was indeed an accurate or appropriate one even though objective evidence was showing otherwise.

According to Rogers (1976), one's attitude toward a new technology is a key element in its diffusion. Roger's Innovation Decision Process theory states that innovation diffusion is a process that occurs over time through five stages: Knowledge, Persuasion, Decision, Implementation and Confirmation. Within the "Decision" process to accept or reject a new technology, escalation of commitment is a common phenomenon, where people could increase their likelihood to invest in an owned technology despite new evidence suggesting that the decision was probably wrong (Staw, 1976). Schmidt and Calantone (2002) found that escalation of commitment is particularly common in new product development. Since podcasting is still considered a novel product in supporting learning (Bongey et al., 2006), escalation of commitment could be very relevant to podcasting acceptance.

Research Models and Hypotheses Development

Core constructs of UTAUT and TAM. The very core constructs common to UTAUT and TAM are PE (PU), EE (PEOU), and BI (IU). The relationships among these core variables have been extensively tested and the rationales behind these hypothesized relationships have been well recognized. While not all empirical studies have confirmed these hypothesized relationships, the majority of the studies do confirm at least part of these relationships. There are no evidences to make different hypotheses concerning these core variables in TAM.

H1: PE would positively affect BI in a podcasting environment.

H2: EE would positively affect BI in a podcasting environment.

H3: EE would positively affect PE in a podcasting environment.

The inter-relationships among the four key antecedents in UTAUT. The social influence construct in the UTAUT model includes the following sub-constructs: subjective norms, social factors, and image. The "image factor" concerns "the degree to which use of an innovation is perceived to enhance one's image or status in one's social system (Moore and Benbasat, 1991).

Our pretest finding showed that this factor was *not relevant* in podcasting acceptance and was subsequently dropped in the official investigation. The social factors (Thompson et al. 1991) concern “the individual’s internalization of the reference group’s subjective culture, and specific interpersonal agreements that the individual has made with others, in specific social situations,” conceptually similar to *peer attitude*, the peer level of participation or resistance in response to a new technology. Martins and Kellermanns (2004) found that peers’ attitude and encouragement positively influence the perception of usefulness and acceptance of a new technology. Along the same vein, subjective norms (Horne, 2001) are rules that a group uses for appropriate and inappropriate values, beliefs, attitudes and behaviors. These rules may be explicit, implicit, subjective, descriptive or injunctive. For instance, in a podcasting context, students would potentially consider using podcasts if people who influence their learning, or work think that they should use podcasts. An individual will consider using a new technology if the majority of colleagues or students in one’s college would actually use it or benefit from it (Venkatesh and Davis, 2000). When the majority of surrounding constituents expect one to use a new technology, the new technology is likely perceived to be useful.

Given the conceptual resemblance between peer attitude (e.g., Martins and Kellermanns, 2004) and social norm (Horne, 2001), we opted to use social norms to represent social influence (SI) in the modified UTAUT because social norms is a more tested construct. Although Venkatesh et. al. (2003) found that SI only affects behavioral intention when the causal-effect relationship is moderated by the interaction of age, voluntary use, and experience of using the technology, TAM-based studies on subjective norms have mixed findings. In an meta-analysis of many TAM-based studies on subjective norm, Schepers and Wetzels (2007) found that there were moderate correlations between subjective norm and behavioral intention and between subjective norm and perceived usefulness and that when applying the structural equation model, these relationships had significant coefficients. Thus the following hypotheses are formulated.

H4a. Social influence would positively affect behavioral intention (BI) in a podcasting context.

H4b. Social influence would positively affect performance expectancy (PE) in a podcasting context.

According to Venkatesh et al. (2003), facilitating conditions (FC) are defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system. Venkatesh et al. (2003) found that there was no significant relationship between FC and BI, arguing that such lack of effect could possibly be a result of the effect being captured by EE. In other words, they implied that FC could be an antecedent to EE. Moreover, it is plausible that FC could have effects on PE and BI if they have been operationalized differently. In a podcasting environment, we postulate that FC could be embodied by two constructs: technical support (Martins and Kellermanns, 2004) and copyright clearance (Selin, 2007).

Technical support availability is measured by the availability of a designated person to help when user of a new technology has questions. It is also reflected in the adequacy of training provided to assist in the use of the new technology. Thus, technical support should facilitate task performance (PE), and enhance usefulness and relative advantage (Davis 1989; Moore and Benbasat 1991; Plouffe et al. 2001). With the availability of a designated person to help when user of a new technology has questions, EE should be minimal and behavioral intention (BI) should be enhanced.

H5a. Technical support would positively affect PE in a podcasting context.

H5b. Technical support would positively affect EE in a podcasting context.

H5c. Technical support would positively affect BI in a podcasting context.

Copyright (Selin, 2007) concerns the clearance of intellectual property right and copyright protection. Copyrighted material is usually valuable. If there is no copyright violation in the course of using high-quality podcast produced by other authors/ educators, the use of podcast will likely enhance PE (as podcasts could complement and facilitate learning), reduce EE (reduce the reinvention of wheels, making quality material readily available) and increase BI (as no legal concern nor additional clearance procedures are required).

H6a. Copyrights/legal issues clearance would positively affect PE in a podcasting context.

H6b. Copyrights/legal issues clearance would positively affect EE in a podcasting context.

H6c. Copyrights/legal issues clearance would positively affect BI in a podcasting context.

External independent variables to UTAUT and TAM. The following variables are identified as possible external antecedents to EE and PE based on literature review on technology acceptance in higher education: *personal innovativeness*, *prior web experience* and *web efficacy*, and escalation of commitment.

Yi and Fiedler (2006) studied the first three variables in acceptance of IT-based innovation. Personal Innovativeness refers to the extent to which an individual will be the pioneer in experimenting new technology. An individual who is personally innovative is likely to be the first among the peers to try out a new technological innovation. With an innovative spirit to explore the unknown and the interest to look for ways to experiment with new technology, we posit that individuals with high *personal innovativeness* will perceive the new technology to be easy to learn to operate or require little mental effort (Legris, Ingham, Collette, 2003).

H7a: Personal Innovativeness would positively affect EE in a podcasting context.

Prior Web Experience (Yi and Fiedler, 2006) refers to an individual's former experience in using related technology in this context. One who is high on prior web experience are likely to frequently use email and web technology for their work in learning (Yi and Fiedler, 2006). An individual's prior web experience could form a good basis for one to experiment with a new technology. We therefore posit that an individual who has lots of *prior web experience* is likely to find podcasts, a web-based technology, easy to learn and use with little effort because of one's previously accumulated knowledge.

H7b: Prior Web Experience would positively affect EE in a podcasting context.

Web Efficacy (Yi and Fiedler, 2006) refers to the confidence level of an individual in using the worldwide web. According to Bandura (1997), self efficacy would positively affect one's confidence and subsequent achievement level. An individual who is high on web efficacy is therefore likely to be confident in using web-based technology. An individual who is high on *web efficacy* is likely to find it effortless or easy to use podcast, a web-based new technology.

H7c: Web Efficacy would positively affect EE in a podcasting context.

The last external independent variable discussed, i-pod ownership, is derived from the theory of escalation of commitment (Staw, 1976). As mentioned earlier, i-pods are not necessary, but conducive to the adoption of podcasts. The theory of escalation of commitment would likely suggest that ownership of an i-pod is a sign of early commitment to a new technology. Individuals who own i-pods have higher potential to embrace new technology

compared to those who do not. Thus, in the context of new technology acceptance, we postulate that the ownership of an i-pod, a relatively new innovation, while not necessary for viewing or listening to podcasts, would likely enhance the likelihood of accepting podcast because a facilitating equipment already existed (BI) according to the theory of escalation of commitment. An i-pod owner's willingness to invest and familiarize with new technology will likely reduce the effort expectancy (EE) required for using podcasts. Further, an i-pod owner must have recognized the benefits (PE) associated with the new technology if an investment is made for such a purchase.

H8a: i-pod ownership would positively affect the behavioral intention to adopt podcasting.

H8b: i-pod ownership would positively affect PE.

H8c: i-pod ownership would positively affect EE.

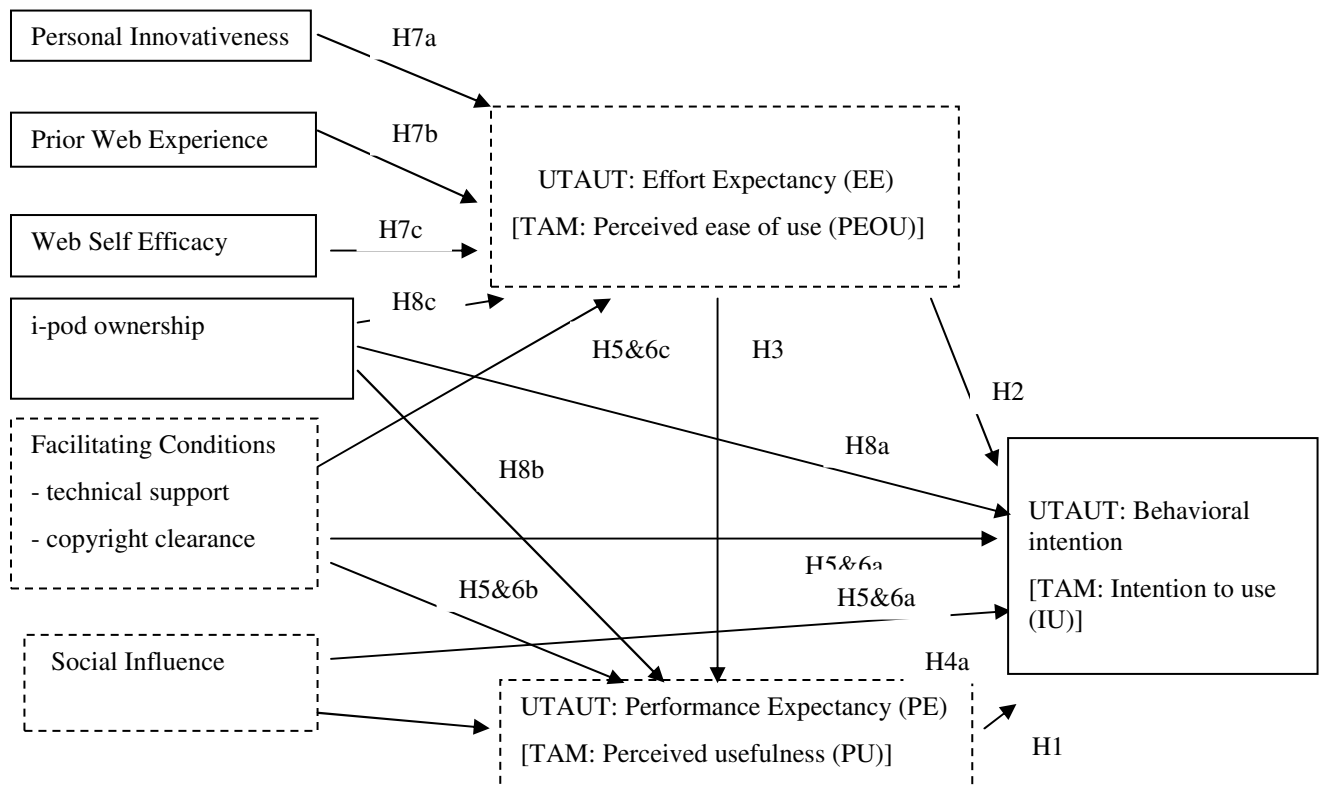


Figure 2. Research Model

Research Setting and Methodology

This research was conducted in a four-year college using questionnaire survey method, including both quantitative and qualitative questions. The survey consisted of three parts. (1) distinguishing user from non-user of iPods, (2) understanding the constructs relevant to adoption of podcasting for student learning, and (3) open-ended questions to

probe respondent needs and concerns. Prior to the answering questions in the survey, each respondent was required to read a short paragraph describing “what”, “who” “how”, “why” of podcasting usage and popularity. The purpose was to qualify the respondent and ensure that a respondent fully understands the topic under evaluation when doing the survey. All the constructs regarding the adoption of podcasting were derived from previous literature to ensure reliability and validity, as shown in table 1. All the constructs, except *ownership of an enhancing product*, were measured with multi-scale items; each item was measured using a five-point Likert scale. The ownership of an enhancing product is operationalized with such a question as whether one owned an i-pod or MP3 player.

Table 1. Constructs in the research model and the literatures from which they are derived

IDV	DV	Articles
Subjective norm	perceived usefulness	Venkatesh and Davis, 2000 Legris, Ingham, Colletette, 2003 Schepers and Wetzels, 2007 Hu, Clark and Ma, 2003 *
	intention to use	Schepers and Wetzels, 2007 Hu, Clark and Ma, 2003 *
Individual innovativeness	perceived usefulness	Yi, Fiedler and Park, 2006
	perceived ease of use	Yi, Fiedler and Park, 2006
	intention to use	Yi, Fiedler and Park, 2006
Technical support availability	perceived ease of use	Martins and Kellermanns, 2004 *
Computer and web experience	perceived ease of use	Martins and Kellermanns, 2004 *
Web self efficacy	perceived ease of use	Martins and Kellermanns, 2004 * Ma and Liu, 2005
	intention to use	Hu, Clark and Ma, 2003 * Ma and Liu, 2005
Clear copy right	perceived usefulness	Selim, 2007
Escalation of commitment (Ownership of an enhancing product)	perceived usefulness perceived ease of use Intention to use	Schmidt and Calantone, 2002

Note: * indicates the literature on TAM applied in the context of higher education

Further validity measures were taken by pre-testing the survey instrument with 15 undergraduate students. Wordings were clarified and confusing questions were reworded or eliminated as appropriate. Then, the survey was distributed both online and offline to approximately 700 students. 213 students from Science, Liberal Arts and Business departments responded to the survey. Usable data was 190 after elimination of invalid and substantially incomplete submissions. Data were being analyzed using factor analysis and multiple regression. Reliability analysis was also performed to ensure the internal consistency of the constructs. The final analysis will be performed with structural

equation model. Content analysis would be employed to present categorical themes that help explain the quantitative results.

Results

Factor analysis, using principal component analysis as the extraction method and Varimax as the rotation method, was conducted on the 8 constructs: subjective norms, individual innovativeness, technical support availability, clear copy right, computer and web experience, Web self efficacy, perceived usefulness, perceived ease of use. The results showed that there are 5 factors with eigenvalues greater than 1, explaining 66.99% of the variance. The loading for all the items were greater than .7, except 4 items which were greater than .6; .7 is the level generally considered acceptable (Compeau and Higgins, 1995; Venkatesh, et. al. 2003).

The first factor combined the items of technical support availability and clear copy right plus one item from social norms (i.e., I would consider using Podcasting if the majority of students in my college use it), accounting for 20.67% of the variance. We deem this new factor as “facilitating conditions” as in UTAUT. The second factor consisted of all the three items of perceived ease of use, explaining 14.83% of variance. We name the factor as “effort expectancy as in UTAUT. The third factor is comprised by all the three items of perceived usefulness, explaining 12.21% of variance. We deem this new factor as “performance expectancy” as in UTAUT. The fourth factor consists of all items of computer and web experience and one item of Web self efficacy (i.e., good at using the Web). This factor continued to be named as computer and web experience and accounts for 12.01% of variance. The fifth factor comprised the other two items in social norms, explaining 7.27% of the variance. This factor is categorized as “social influence” as in UTAUT. All the items of individual innovativeness and two items of Web self efficacy do not generate any loadings greater than .6 in any of these five factors and subsequently are dropped for further analysis.

Cronbach’s alpha measures of internal consistency reliability were all at least .7 for all the constructs: facilitating conditions (.90), computer and web experience (.75), social influences (.82), performance expectancy (.92), effort expectancy (.80), and intention to use (.91).

The result for the multiple regression analysis is shown in figure 2 below. The regression equation with effort expectancy as the dependent variable is significant, adjusted $R^2 = .29$, $F(4,158) = 15.76$, $p < .001$. The regression equation with performance expectancy as the dependent variable is significant, adjusted $R^2 = .73$, $F(5,151) = 34.40$, $p < .001$. The regression equation with intention to use as the dependent variable is significant, adjusted $R^2 = .73$, $F(6,146) = 66.79$, $p < .001$.

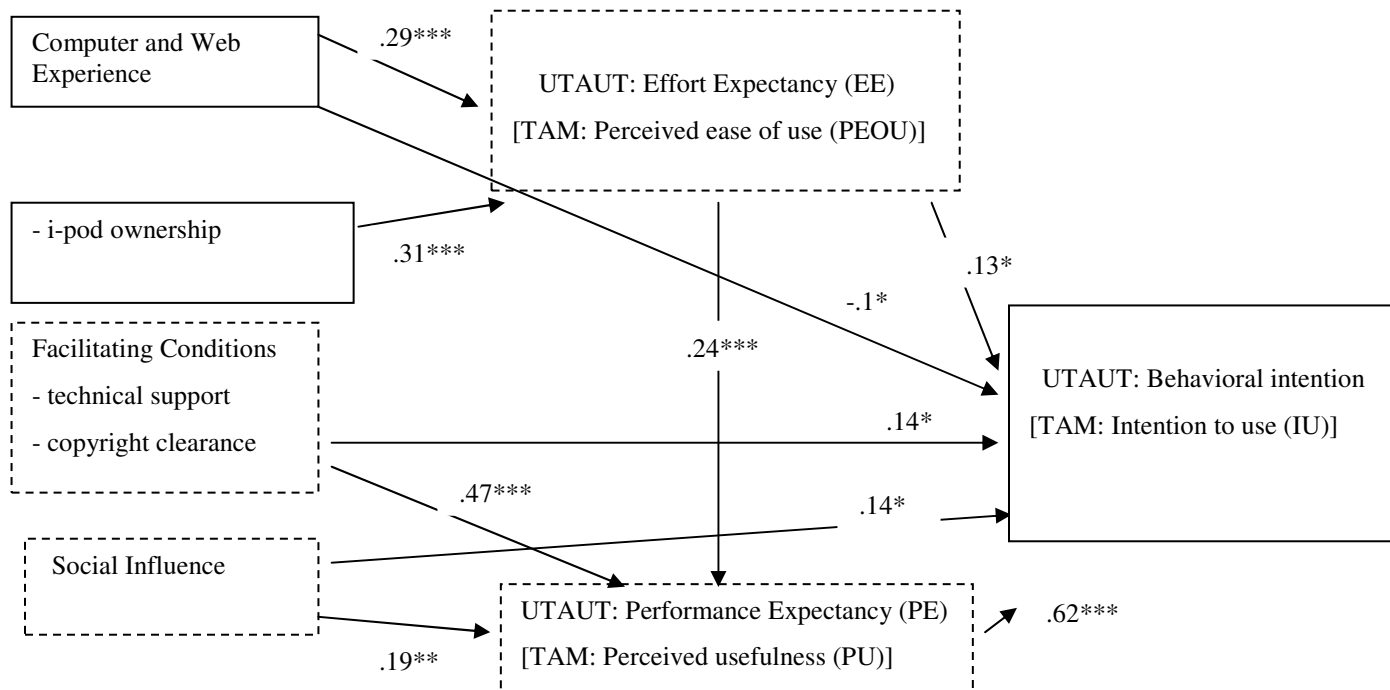


Figure 3. Result of multiple regression analysis

*** $p < .001$; ** $p < .01$; * $p < .05$; $p < .10$. Standardized regression coefficients (betas) for the respective regression equations are reported

Discussion

The results confirmed all our hypotheses except the following. First, both social influence (SI) and facilitating conditions (FC) only affect behavioral intention (BI) and performance expectancy (PE) as hypothesized, but not effort expectancy (EE). However, PE is the only antecedent to BI that has a strong effect. Given that FC has also a strong effect on PE and SI has a moderate effect on PE, it seems to suggest that the effects of SI and FC on BI are mediated by PE.

Second, ipod ownership only affects EE as hypothesized, but not PE and BI. Despite that i-pod owners are more inclined to perceive podcasting easy to use than non-owners, i-pod owners are not necessarily more willing to

recognize the usefulness of podcasting and to accept it as a supplemental learning technology. This seems to suggest that there is no phenomenon of escalation of commitment in the podcasting context.

Third, computer and Web experience has a relatively weak negative effect on BI and a positive moderate effect on EE. Computer and Web experience is operationalized with using search engines, emails, and Web for class-related activities. The result shows that those respondents who have a better computer and Web experience in learning might feel that the existing Web tools in supporting learning are adequate or even slightly more than sufficient; they could do away with another novel learning technology.

Conclusion

We expect this study will generate both theoretically and practically useful implications. Theoretically, this study could enhance UTAUT in two regards. First, it applied UTAUT to study a new technology context and potentially could further validate UTAUT as a universal framework for evaluating the acceptance of a new technology. Second, the concept of escalation of commitment would help enrich UTAUT and its intellectual inquiries. Future studies can continue to investigate the moderating variables in UTAUT (e.g., gender, age, experience, and voluntariness), that were excluded in the current research model. Practically, our findings have highlighted the key ingredient in a receipt for successful podcasting acceptance in classrooms, which could help administrators and practitioners in an educational setting to better plan the adoption of educational technology innovations.

The final analysis result of both student and faculty data with structural equation model will be ready to be presented at the conference.

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