

Perceptual Antecedents of Student Attitudes Toward a Learning Management System: The Case of Using Canvas

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This paper explores the application of the technology acceptance model (TAM) and the unified theory of acceptance and use of technology (UTAUT) to a course management system in student learning. Through a TAM-aligned UTAUT model, it examines the influences of performance expectancy, effort expectancy, perceived enjoyment, social influence, and facilitating conditions on student attitude toward using a learning management system. The hypothesized relationships in the model were tested via Canvas. Results provide evidence that the TAM-aligned UTAUT model is applicable to examining factors influencing learner attitude and behavioral intentions in the use of technology-supported learning management systems.

Keywords: learning management system (LMS), technology acceptance model (TAM), UTAUT, technology-enabled learning, student attitudes

INTRODUCTION

Technology-supported learning is extensively explored in educational research. Student experience with online course management systems impacts student learning processes as well as learning outcomes (Alyoussef, 2021; Chao, 2019). Models evaluating technology-supported learning systems have been proposed and studied in measuring learning system success (Al-Fraihat, 2020; Al-Rahmi et al., 2019), quality (Vasconcelos et al., 2020), student satisfaction (Yilmaz, 2017), and academic performance (Alhussain, 2020).

Models and theories in reference disciplines have been previously applied to study the effectiveness of educational technology (Hrastinski & Keller, 2007). This paper reviews the literature on the technology acceptance model (TAM), the unified theory of acceptance and use of technology (UTAUT), and related constructs in existing research. It reports findings from a field study of applying a modified framework to student experience with a learning management system Canvas.

The Technology Acceptance Model (TAM)

Based on the theory of reasoned actions (TRA) (Ajzen & Fishbein, 1980), the Technology Acceptance Model posits that a user's interests, motivation, and experience influence a user's attitude toward using (ATT) and intention to use technology (Davis et al., 1989). TAM has been widely adopted in studies exploring technology acceptance due to its reliable constructs. Subsequent research has expanded the models by adding other variables and moderators in predicting technology acceptance in various contexts (Alwahaishi & Snasel, 2013; Chao, 2019; Jaradat et al., 2020; Lee & Song, 2013).

The TAM model is considered a practical approach to predicting user intentions in e-learning in literature studying technology acceptance in learning. In an extended TAM model, perceived usefulness, ease of use, and enjoyment are positively associated with user attitude toward using clickers as an interactive learning technology in the classroom (Wu & Gao, 2011). Perceived usefulness and perceived ease of use are found to influence the behavioral intentions of both students and teachers to use e-learning systems (Wu & Chen, 2017).

The Unified Theory of Acceptance and Use of Technology (UTAUT)

The unified theory of acceptance and use of technology (UTAUT) aims to explain technology acceptance through predictors of behavioral intentions and actual usage (Venkatesh et al., 2003). Alongside the main constructs from TAM, UTAUT also incorporates the Innovation Diffusion Theory (Rogers, 2003) and the social cognitive theory (Magsamen-Conrad et al., 2015) as important parts of the unified model. The main predictors in UTAUT include performance expectancy, effort expectancy, social influence, and facilitating conditions.

Performance expectancy in UTAUT refers to perceived usefulness of using a technology, while effort expectancy refers to the ease of use of a technology. Both constructs are part of the TAM model. In addition, the social influence construct in UTAUT refers to the extent to which an individual's use of technology is influenced by people he or she considers important, and facilitating conditions refer to the extent of perceived existence of organizational or technical support for using technology (Venkatesh et al., 2012).

UTAUT has been shown to predict user intentions toward e-learning systems (Evans & Roux, 2015; Koc et al., 2016). Effort expectancy, performance expectancy, social influence, and facilitating conditions all contribute to behavioral intentions in e-learning (Tewari et al., 2023). UTAUT constructs also significantly determine behavioral intentions to use mobile learning systems (Acharjya & Das, 2022; Naveed, et al., 2020; Welch et al., 2020).

Perceived Enjoyment

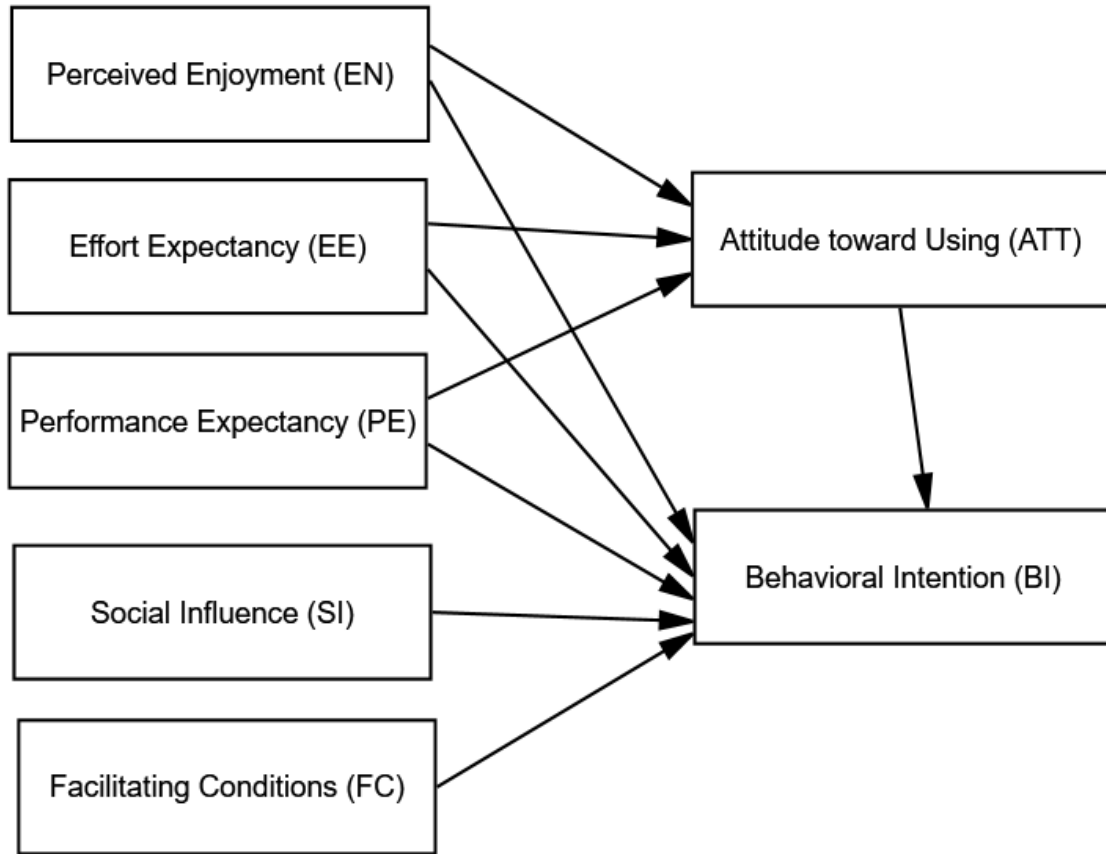
Research on uses and gratifications indicates the entertainment value of any exchange through some media derives from its ability to fulfill the audience's needs for escapism, diversion, aesthetic enjoyment, or emotional release (McQuail, 1983). According to flow theory, perceived enjoyment is the extent to which an activity is perceived to be enjoyable in its own right, aside from any utilitarian goals (Davis et al., 1992; Koufaris, 2002). Computer playfulness is the degree of pleasure and enjoyment users experience while interacting with technologies (Moon & Kim, 2001). Those constructs are among variables added to TAM research after the original TAM model. The impact of perceived enjoyment on behavioral intentions has been shown in using an online ride share app (Septiani et al., 2017). In addition to the main constructs in TAM and UTAUT, hedonistic motivation also plays a role in technology acceptance (Venkatesh, et al., 2012).

The Research Framework

This research proposes a model, shown in Figure 1, that depicts how TAM and UTAUT factors, with the addition of perceived enjoyment, influence a user's attitude toward using a learning management system and intention to use such a technology-supported platform. TAM considers perceived ease of use and perceived usefulness, referred to as effort expectancy and performance expectancy in the UTAUT model, respectively, as cognitive antecedents of a user's attitude toward using technology, which subsequently influence a user's behavioral intentions. Attitude here refers to an individual's feelings towards using a technology (Fishbein & Ajzen, 1975).

In the UTAUT model, effort expectancy, performance expectancy, social influence, and facilitating conditions influence a user's behavioral intention and the actual use of technology. TAM considers attitude a strong predictor of user intention toward using technology (Davis, 1989). Though excluded from UTAUT, Venkatesh and colleagues (2003) acknowledge that prior research has shown that attitude is a significant predictor of intention when effort or performance expectancy are excluded.

FIGURE 1
TAM-ALIGNED UTAUT WITH PERCEIVED ENJOYMENT



When comparing the validity of several modified versions of UTAUT, Thomas and colleagues (2013) evaluate the size and direction of the impact of UTAUT factors and attitude on behavioral intentions to adopt mobile learning, and find attitude has a significant impact on behavioral intentions even with both effort expectancy and performance expectancy included. They find the percentage of variance in behavioral intentions explained is substantially higher in the model inclusive of attitude as a factor than two other models, and consider the modified UTAUT model inclusive of attitude the preferred model for evaluating mobile learning adoption in their study.

When applying a modified version of the UTAUT model - including attitude and other UTAUT factors - to a social learning platform PairForm, Khechine and Augier (2019) find attitude having the largest effect on behavioral intentions in their study. Attitude is also found to significantly impact behavioral intentions of school teachers adopting online teaching during the pandemic (Sangeeta & Tandon, 2021).

Another study with a modified UTAUT model inclusive of attitude confirms that a positive attitude significantly impacts using a mobile learning system (Naveed, et al., 2020). Acharjya and Das (2022) also find attitude a significant factor, along with performance expectancy, social influence and facilitating conditions, in determining e-learning adoption among college students in India.

Henceforth, this study will emphasize the predictive value of attitude on behavioral intentions alongside effort expectancy, performance expectancy, social influence, and facilitating conditions. The current research proposes the following hypotheses in a TAM-aligned UTAUT model, with the purposeful inclusion of the attitude construct, which is not part of the original UTAUT model, and the addition of the perceived enjoyment construct.

- H1. Effort expectancy is positively associated with attitude toward using a learning management system.*
- H2. Performance expectancy is positively associated with attitude toward using a learning management system.*
- H3. Perceived enjoyment is positively associated with attitude toward using a learning management system.*
- H4. Effort expectancy is positively associated with intention to use a learning management system.*
- H5. Performance expectancy is positively associated with intention to use a learning management system.*
- H6. Perceived enjoyment is positively associated with intention to use a learning management system.*
- H7. Social influence is positively associated with intention to use a learning management system.*
- H8. Facilitating conditions are positively associated with intention to use a learning management system.*
- H9. Attitude toward using is positively associated with intention to use a learning management system.*

METHOD

To test the proposed model, a field study was conducted through a survey administered among students in a northeastern college of the US. Scale items measuring variables outlined in the model were adapted from existing literature (Davis et al., 1992; Venkatesh et al., 2012). Table 1 lists the constructs and scale items used in this study.

The survey instructs participants to complete a series of entries regarding their experience in using the Canvas learning management system that the college adopts. Canvas is a popular web-based learning management system that supports educators and learners in over 7,000 institutions and in over 100 countries (Tullis, 2023).

**TABLE 1
CONSTRUCTS AND SCALE ITEMS**

Constructs	Scale Items
Effort Expectancy (Perceived Ease of Use) (EE)	Learning to use Canvas is easy for me.
	My interaction with Canvas is clear and understandable.
	Finding or using features in Canvas is easy.
Performance Expectancy (Perceived Usefulness) (PE)	Using Canvas would improve my learning performance.
	Using Canvas increases my chances of achieving learning that is important to me.
	Using Canvas would allow me to accomplish learning tasks more quickly.
Perceived Enjoyment (EN)	Using Canvas would enhance my effectiveness in learning.
	Using Canvas is enjoyable.
	Using Canvas is entertaining.
	Using Canvas is fun.

Social Influence (SI)	People who are important to me think that I should use online learning.
	People who influence my behavior think that I should use online learning.
	People whose opinions that I value prefer that I use online learning.
Facilitating Conditions (FC)	I have the resources necessary to use online learning.
	I have the knowledge necessary to use online learning.
	I have the support necessary to use online learning.
	Online learning is compatible with other technologies I use.
Attitude (ATT)	I like working with Canvas.
	Canvas makes learning more interesting.
	Using Canvas is a good idea.
Behavioral Intention (BI)	I intend to use Canvas in the future.
	I will use Canvas in the future.
	I plan to use Canvas in the future.

Students were given an incentive to complete the survey for extra course credit. They are requested to indicate their agreement or disagreement with statements on a 7-point differential scale. The questionnaire contains no identifying information about individual participants. A total of 202 survey responses were complete and useful for this study.

RESULTS

Participants are all undergraduate students enrolled in business majors. Overall students are experienced in using Canvas. Over 50% of the participants indicated they have used Canvas in 10 or more classes, with the rest having taken on average about 5 classes. Participants indicated they used Canvas in both purely online and hybrid online/in-person classes, with about 50% for each course type.

Students have a generally favorable attitude toward using Canvas. On a seven-point scale, mean value of attitude is 5.45. They also perceive Canvas as easy to use (6.05) and useful (5.34). All constructs exhibit acceptable level of reliability, with Cronbach's alpha values exceeding the recommended 0.6 (Malhotra, 1993, p. 305). Respective values are shown in Table 2.

TABLE 2
SCALE RELIABILITY AND MEAN VALUES

Scale	Cronbach's Alpha	Mean
Effort Expectancy (EE)	0.7315	6.05
Performance Expectancy (PE)	0.7832	5.34
Perceived Enjoyment (EN)	0.8245	4.91
Social Influence (SI)	0.8507	4.51
Facilitating Conditions (FC)	0.7544	6.07
Attitude (ATT)	0.6990	5.45
Behavioral Intention (BI)	0.7923	5.76

The structural model is investigated using SPSS AMOS 26. Path analysis is performed using standardized maximum likelihood estimation. The path modeling method tests the overall model fit with multiple endogenous variables and a priori hypotheses.

The chi-square test, assessing the overall model fit, is not significant (Chi-square = 3.283, $p = 0.194$), indicating that the model cannot be rejected. Chi-square per degree of freedom (CMIN/DF), the relative chi-square, is 1.642, satisfying the recommend <2 criterion for a good fit (Hu & Bentler, 1999).

Comparative fit index (CFI), goodness of fit index (GFI), normed fit index (NFI), and relative fit index (RFI) all exceed the recommended threshold level of 0.9 (CFI=0.998, GFI=0.995, NFI=0.995, RFI=0.952), and the root mean square error of approximation (RMSEA) is 0.056, below the recommended 0.06 level (Hu & Bentler, 1999). Thus, the model has a good fit.

FIGURE 2
STRUCTURAL MODEL PATH COEFFICIENTS

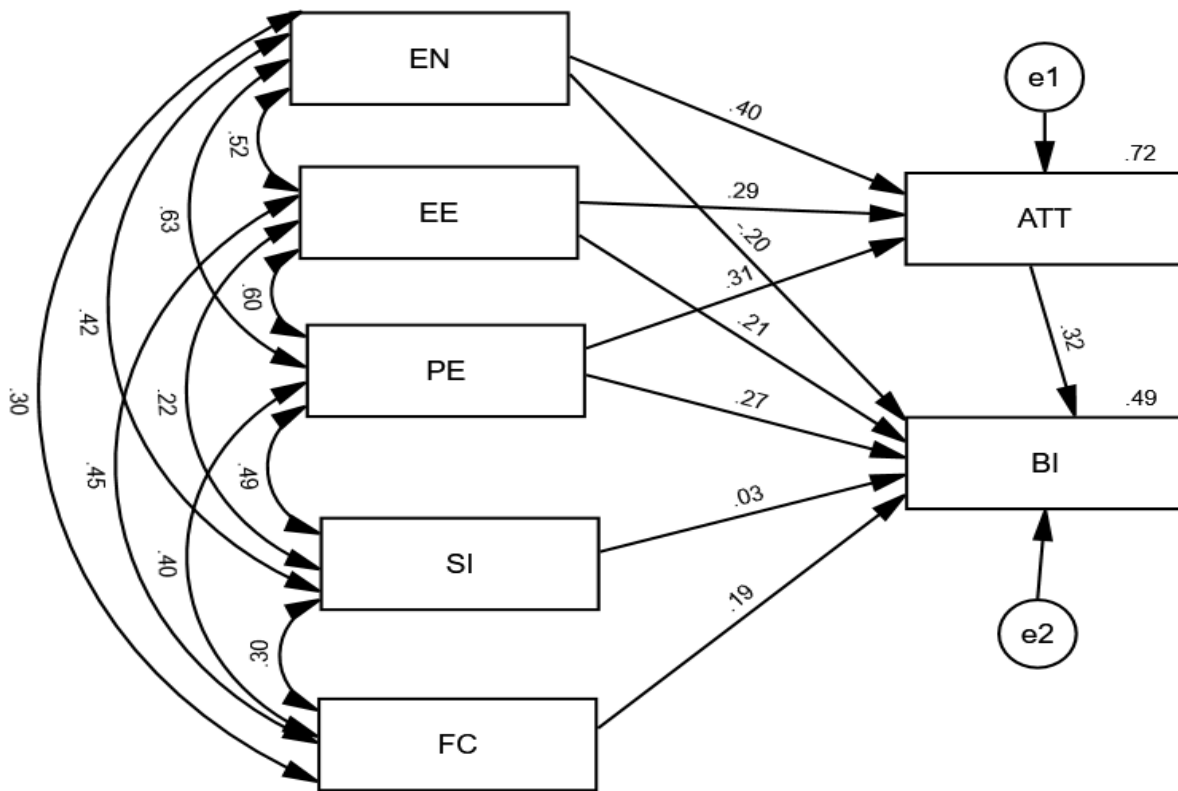


Figure 2 shows the path modeling results with correlations among exogenous variables, standardized beta weights, and squared multiple correlations of endogenous variables.

Of the three variables hypothesized to influence attitude, effort expectancy, performance expectancy, and perceived enjoyment are significant predictors at $p < 0.01$, supporting H1, H2, and H3. Of the six variables hypothesized to influence intention, effort expectancy, performance expectancy, facilitating conditions, and attitude are significant predictors of intention to use at $p < 0.01$, supporting H4, H5, H8, and H9. Perceived enjoyment has an inverse association with intention to use with a negative beta coefficient, and social influence is not a significant predictor of intention to use, thus H6 and H7 are not supported.

The squared multiple correlations indicate that this model explains 72% of variance in the endogenous variable attitude, and 49% of variance in the endogenous variable intention to use. Table 3 summarizes the results of hypothesis testing.

TABLE 3
RESULTS OF HYPOTHESIS TESTING

Hypotheses	Symbols	Std. Coefficients	p	Support
1. Effort expectancy is positively associated with attitude toward using a learning management system.	EE → ATT	0.291	< .01	Yes
2. Performance expectancy is positively associated with attitude toward using a learning management system.	PE → ATT	0.309	< .01	Yes
3. Perceived enjoyment is positively associated with attitude toward using a learning management system.	EN → ATT	0.397	< .01	Yes
4. Effort expectancy is positively associated with intention to use a learning management system.	EE → BI	0.207	< .01	Yes
5. Performance expectancy is positively associated with intention to use a learning management system.	PE → BI	0.268	< .01	Yes
6. Perceived enjoyment is positively associated with intention to use a learning management system.	EN → BI	-0.198	.011	No
7. Social influence is positively associated with intention to use a learning management system.	SI → BI	0.032	.591	No
8. Facilitating conditions are positively associated with intention to use a learning management system.	FC → BI	0.188	< .01	Yes
9. Attitude toward using is positively associated with intention to use a learning management system.	ATT → BI	0.318	< .01	Yes

DISCUSSION

This study finds that the original TAM model is strongly supported, with both effort expectancy and performance expectancy – the equivalent constructs of perceived ease of use and perceived usefulness in TAM – turning out to be significant predictors of attitude, showing the parsimonious nature of the TAM constructs. In addition, perceived enjoyment also turns out to be a significant predictor of attitude toward using technology, similar to findings in prior studies (Moon & Kim, 2001; Wu & Gao, 2011).

Of interest to note is that the result of this study shows perceived enjoyment marginally significantly but inversely affects intention to use (beta = -.20, p= .011), which contradicts the hypothesized direction based on past research. Being a significant predictor of attitude, perceived enjoyment could indirectly impact behavioral intentions through attitude. Perceived enjoyment and behavioral intentions are also significantly and inversely related in the results of a study on acceptance of online learning in the Philippines, though perceived enjoyment significantly and positively affects both effort expectancy and performance expectancy in that study (Batuca et al., 2022). Future research should further discern the route perceived enjoyment may impact behavioral intentions in acceptance of online learning systems, potentially indirectly through performance expectancy, effort expectancy, and attitude.

UTAUT differs from TAM by eliminating the attitude construct from TAM. This study considers the attitude construct as an important intermediate variable between users' cognitive perceptions and behavioral intentions. In this TAM-aligned UTAUT model, four of the six constructs hypothesized to influence intention, namely effort expectancy, performance expectancy, facilitating conditions, and attitude, turn out to be significant predictors of intention to use in the hypothesized direction. In particular, attitude has the most significant effect in predicting intention to use among all the predictors. This result echoes findings

in previous studies with modified UTAUT models (Khechine & Augier, 2019; Naveed et al., 2020; Sangeeta & Tandon, 2021; Thomas et al., 2013).

Relative to TAM, the two main additional constructs considered in UTAUT are social influence and facilitating conditions. In this study, the observed means of social influence and facilitating conditions, as shown in Table 2, have the lowest and highest values of 4.51 and 6.07, respectively. Participants of this study consider facilitating conditions important contributors to their intention to use an online learning system, but they are less likely to be influenced by opinions of their social peers.

Chen and Hwang (2019) have similar findings in that social influence has an insignificant relationship with behavioral intentions in online learning among college students, while facilitating conditions positively influence behavioral intentions. Khechine and Augier (2019) do not find social influence a significant predictor of behavioral intention in using a social learning platform, and Naveed and colleagues (2020) do not find any significant effect of social influence on the use of a mobile learning system, while both studies find facilitating conditions having a significant impact on behavioral intentions.

This absence of a significant relationship between social influence and behavioral intentions could be due to the unique nature of the technology being studied, an online learning system with its users being college students. Whether the same conclusion holds with another learning technology or a different user population should be explored in further research.

The UTAUT model includes age, gender, experience, and voluntariness as moderators of effect on behavioral intentions. Past research has shown limited effects of age and gender moderating UTAUT relationships. Acharjya and Das (2022) find just one out of four hypothesized moderating effects by gender, and one out of four by age, significant.

This study does not include those moderators due to the homogeneous population of our study participants in terms of age, experience, and voluntariness. Any potential differential effect of gender within this homogeneous population are likely minimal and probably offer little value in informing future practice. Students as participants in this study also have limited discretion on whether they use or not use a learning management system, impacting the scope of any voluntariness construct. Based on those consideration, this study did not examine these moderating factors that were part of the original UTAUT model. Future research can expand the demographics of the participants population to study how these moderating factors play a role in this model.

CONCLUSION

In summary, this study develops and tests the validity of an expanded framework incorporating constructs in TAM and UTAUT in predicting acceptance of a technology-supported learning system. Results show that attitude has a significant effect on behavioral intentions. In addition, effort expectancy, performance expectancy, and facilitating conditions all contribute to a learner's intention to use the learning management platform. Social influence is an insignificant factor, adding evidence to prior research of the weakness of its predictive power of behavioral intentions in online and mobile learning studies. Results provide evidence that the extended model applies to examining factors influencing learner attitude and behavioral intentions in using technology-supported course management systems. Confirming that facilitating conditions positively influence user intentions encourages learning technology administrators to invest in human and technological resources that further facilitate learner access, training and support, nurture a more favorable attitude toward using technology, and motivate wider and more in-depth usage of such learning management systems.

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