

Factors Affecting the Acceptance of Blended Learning in Medical Education: Application of UTAUT2 Model

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Abstract

Background: Blended learning is a new approach toward improving the quality of medical education. Acceptance of blended learning plays an important role in its effective implementation. Therefore, the purpose of this study was to investigate and determine the factors that may influence the behavioral intention to use of blended learning in medical education.

Methods: In this cross-sectional, correlational study, the sample consisted of 225 Iranian medical sciences students. The theoretical framework for designing the conceptual model was UTAUT2. Data were analyzed using SPSS-18 and AMOS-23 software. Structural equation modeling technique was used to test the hypothesis.

Results: The validity and reliability of the model constructs were acceptable. Performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value and habit had a significant effect on students' behavioral intention to use of blended learning. Additionally, Behavioral intention to use of blended learning also had a significant effect on students' actual usage of blended learning ($\beta=0.645$, $P\leq 0.01$).

Conclusion: The study revealed that the proposed framework based on UTAUT2 has good potential to identify factors influencing students' behavioral intention to using of blended learning. Universities can use the results of this study to design and implementation successful blended learning courses in medical education.

Background

Blended learning (BL) can be useful and effective in teaching clinical skills and medical education (1-4). This approach is a good platform for linking theory and practice in the teaching-learning process (5). BL or hybrid learning is defined as the systematic integration of face-to-face learning and online learning (6-10). BL encourages learners to problem solving and challenges related to learning and sharing learning experiences (11). This approach also plays a significant role in enhancing students' knowledge and skills and flexibility in the teaching-learning process (5, 12). According to the results of a study, BL has a positive effect on deep and sustainable learning in medical education courses (11). The results of a meta-analysis showed that BL has a positive effect on knowledge acquisition in the health sciences (13). The findings of another study showed that BL enables students to use different learning styles (5). Most comparative studies have shown that BL is more effective than the face-to-face or online learning approach (13-15).

Successful use of the BL approach in curriculum requires students' readiness to use of BL. Therefore, it is important to identify the social, psychological, cultural and pedagogical factors that may influence the acceptance of BL. Zhao & Yuan (2010) showed that e-learning adaptability, perceived usefulness, perceived ease of use and in-time of teacher's feed-back are the most important factors affecting learner satisfaction in using the BL approach (16). Garcia et al. (2014) reported that the outcome expectancy,

facilitating conditions and social influence have a positive impact on behavioral intention to use BL (17). Tang & Chaw (2013) found in a study that variables of Attitudes to online learning, study management, online interaction and learning flexibility were positively correlated to students' readiness for BL (18). Yeou (2016) explored that computer self-efficacy and perceived usefulness play an important role in acceptance of BL (19). The findings of Wu and Liu (2013) showed a positive effect of learning atmosphere, perceived enjoyment, perceived usefulness, system performance, social interaction, content specificity, and performance expectation on students' satisfaction with BL (8). As indicated above, BL is a new approach in colleges and universities (20). Therefore, it is important to identify the key factors affecting its acceptance. Considering to paucity of knowledge about topic of present paper, this study was conducted. The purpose of this study was to identify the factors affecting the students' behavioral intention to use of BL in medical education based on the unified theory of acceptance and use of technology 2 (UTAUT2). In the following section, we will discuss the UTAUT2 and conceptual model constructs.

Theoretical background and study hypotheses

The UTAUT model is one of the most important models in the field of technology adoption and has been developed by Venkatesh et al. (2003) (21). This model is a new form of the technology acceptance model. The UTAUT model analyzes the behavioral intention of users to use a technology (16). Evidence shows that UTAUT explains 70% of the variance in users' behavioral intention to adopt a technology (22, 23). The model consists of four main constructs (performance expectancy, effort expectancy, social influences, and facilitating conditions) about the intention and behavior of using a technology (21). The UTAUT2 framework was designed by Venkatesh et al. (2012) based on the original version of the UTAUT model (24, 25). The UTAUT2 has other constructs such as price value, hedonic motivation, and habit (25). The next section describes the model constructs designed based on the UTAUT2 framework (Fig 1).

Performance Expectancy (PE)

PE is defined as "the degree to which an individual believes that using the technology will help him or her to achieve a profit in performance" (21, 25). In this study, performance expectancy refers to learners' belief that using BL is helpful. The results of some studies emphasized the positive effect of PE on behavioral intention (26-30).

H1: PE will have a significant influence on students' behavioral intention to use BL

Effort Expectancy (EE)

EE is defined as "the degree of simplicity and ease of use of a system" (21). This construct is similar to the construct of ease of use perceived in the technology acceptance model. Some studies have indicated that EE predicts behavioral intention to use e-learning system (26, 27).

H2: EE will have a significant influence on students' behavioral intention to use BL

Social Influence (SI)

SI is defined as “the degree to which an individual perceives that important others (such as peers and faculty members) believe he or she should use the modern system or new approach in learning” (21). Several studies have shown that SI has a significant influence on the behavioral intention of adopting a system (17, 31, 32). **H3:** SI will have a significant influence on students' behavioral intention to use BL

Facilitating Condition (FC)

FC expresses “the learner's insights into the existence of technological and organizational infrastructure and equipment to support the use of a system” (32). In this regard, Sattari et al. (2017) showed that FC had a significant effect on behavioral intention and the use of the e-learning system (33). However, Hoque and Sorwar (2017) reported that FC had no significant effect on intention to use mobile health technology (28).

H4: FC will have a significant influence on students' behavioral intention to use BL

H5: FC will have a significant influence on students' actual usage of BL

Hedonic motivation (HM)

HM is a new construct in the UTAUT2. This construct is defined as “the user pleasure of using a system” (25). According to studies, the HM is one of the important factors in predicting the intention to use e-learning and mobile learning (31, 32).

H6: HM will have a significant influence on students' behavioral intention to use BL

Price value (PV)

This construct is defined as “the learners' understanding trade-off between the perceived benefits of the technology and the monetary cost paid for adoption the technology (25). If the benefits of acceptance of BL are perceived to be greater than the monetary cost, students are more likely to accept it. In this regard, Moorthy et al. (2019) reported that financial value has a positive effect on the behavioral intention to use a system (32).

H7: PV will have a significant influence on students' behavioral intention to use BL

Habit (HB)

HB is defined as “a students' degree of tendency to perform habitual behaviors in the teaching-learning process”. This construct is rooted in one's past experiences (25). A person's favorable experiences in using a system automatically lead to a positive belief in the person (34, 35). Some studies have shown that habit has a positive influence on behavioral intention (24, 31, 32).

H8: HB will have a significant influence on students' behavioral intention to use BL

H9: HB will have a significant influence on students' actual usage of BL

Behavioral Intention (BI)

Behavioral intention means the likelihood of a person using a technology. The actual usage of a technology occurs when a person intends to use it. Evidence showed that behavioral intention has a direct impact on actual usage of technology (26, 30, 36).

H10: Students' behavioral intention to use of BL will have a significant influence on actual usage of BL

Research Method

The method of this study was cross sectional, correlational.

Sample and Sampling

The study population consisted of all students of Kermanshah University of Medical Sciences (KUMS), in Iran. The optimal sample size was determined to be 230 people using the correlation coefficient formula ($n = 230$). The sampling method was stratified random. The KUMS' schools formed the sampling stratum. The Sampling was performed in each stratum by a stratified random method and using a table of random numbers. After distributing the questionnaires among the samples, 225 questionnaires were finally collected. Response rate was 0.97%. Students' inclusion criteria included their satisfaction and complete willingness to participate in study and studying at the second semester of the academic year 2019–2020. Incomplete filling of the questionnaire was determined as the exclusion criterion.

Instrument development

Data collection was performed using a two-part questionnaire. The first section included demographic questions form about the gender and age. The second section included items about acceptance of BL. The items of the questionnaire were designed based on the UTAUT2 framework. In order to design the questionnaire items, we examined the questionnaires based on the UTAUT2 in other studies (25-27, 37, 38). Finally, we designed a questionnaire consists of 31 items and 9 construct including PE (5 items), EE (4 items), SI (4 items), FC (3 items), HM (4 items), PV (3 items), HB (4 items), behavioral intention to blended learning (2 items) and use behavior of blended learning (2 items). Samples showed their responses on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). The content and face validity of the questionnaire was evaluated by eight experts and researchers in the field of medical education, BL and e-learning. The validity of the final version of the questionnaire was assessed using content validity indices (CVI) and Content Validity Ration (CVR), which were 0.87 and 0.84, respectively. To determine internal consistency, 35 questionnaires were distributed among samples. Then the internal consistency of the questionnaire was calculated using Cronbach's alpha coefficient of 0.942.

Statistical analysis

The data were analyzed using SPSS version 18.0 and AMOS version 23.0. The validity of the model constructs was determined using two types of validity including convergent validity and discriminant validity. The convergent validity was assessed using factors loadings (FL), Cronbach's alpha (CA), composite reliability (CR) and average variance extracted (AVE). Acceptable level for FL, CA and CR were determined greater than 0.70 and for AVE was above 0.50 (39, 40). The discriminant validity was assessed using comparing correlations coefficients between constructs and the square root of the AVE.

The CR index was calculated using the formula $CR = (\sum FI)^2 / (\sum FI)^2 + (\sum 1-fl)^2$ and the AVE index was calculated using the formula $AVE = \sum (fl^2) / n$ (41, 42). The structural equation modeling (SEM) was used to analyze the study hypotheses. Significance level $P \leq 0.05$ was determined.

Procedures

This study was conducted in Kermanshah, Iran, in 2019. We first obtained research permission from the KUMS's research deputy and the national agency for strategic research in medical education (NASR). To get the list of students, we went to the department of education at each of the schools of KUMS. Then the students' list was numbered, and samples were selected based on the table of random numbers. After selecting the samples and according to the classroom schedule, the researcher referred to the students. The purposes of the study were stated for them. Then students who were willing to participate in the study the questionnaires were given to them. After the questionnaires were completed by the students, were collected.

Ethical consideration

This study was conducted in accordance with ethical consideration of the Helsinki declaration and approved by KUMS and NASR. In line with ethical requirements, the objectives of the study for the samples were explained. Furthermore, written informed consent was obtained from all of students.

Data Analysis Results

The demographic characteristics of the students are given in Table 1. In total, 225 students were included in the study. More than half of the students were female ($n=123$, 54.7%) and the rests were male ($n=102$, 45.3%). In terms of age, the majority of students were in the range of 20-22 ($n= 121$, 53.8%). The mean age of the students was 22.77 ± 1.58 .

In Table 2, the results of convergent validity are presented. In order to evaluate convergent validity, values of standardized factor loadings, Cronbach's alpha, composite reliability and average variance extracted, were calculated. Factor loadings in all items were higher than 0.70. For all constructs, Cronbach's alpha reliability coefficients were higher than 0.70. In addition, for all constructs the CR index and the AVE index were calculated above 0.70 and above 0.50, respectively (Table 2). According to these results, convergent validity was at the optimal level.

The results of discriminant validity are presented in Table 3. This index was evaluated using the square roots of the AVE. If the square root of the AVE of a factor is greater than the correlation coefficient of the factor, it can be stated that the questionnaire has good discriminant validity (41, 43). In this study, the results showed that the questionnaire has excellent discriminant validity (Table 3).

The results of the structural model test are presented in figure 2. Constructs of PE ($\beta=0.225$, $P\leq 0.01$), EE ($\beta=0.679$, $P\leq 0.01$), SI ($\beta=0.241$, $P\leq 0.01$), FC ($\beta=0.156$, $P\leq 0.01$), HM ($\beta=0.657$, $P\leq 0.01$), PV ($\beta=0.142$, $P\leq 0.01$) and HB ($\beta=0.463$, $P\leq 0.01$) had a positive and significant effect on students' behavioral intention to use BL. HB had a positive and significant effect on actual usage of BL ($\beta=0.435$, $P\leq 0.01$). In this model, FC had no significant effect on actual usage of BL. Also students' behavioral intention to use BL had a significant and positive effect on actual usage of BL ($\beta=0.645$, $P\leq 0.01$).

Discussion

This study examined the factors affecting the acceptance of BL in medical education based on the UTAUT2 framework. In the following, we will discuss the study hypotheses.

The results revealed that PE has a significant and positive effect on students' behavioral intention to use BL. This was in line with the findings of Hoque and Sorwar (2017) (28) and Suki and Suki (2017) (38). Additionally, Abdekhoda et al. (2016) reported that PE has direct and significant effect on use of e-learning (26). Therefore, the use of the BL system in medical education is useful and valuable. Our study showed that EE has a positive and significant effect on students' behavioral intention to use BL. The results of other studies confirm this finding (26-28). In this regard, Suki and Suki (2017) revealed that EE has a significant effect on use of animation and storytelling (38). Based on this part of the findings, teaching and learning is easy in the BL environment.

SI had a significant and positive effect on students' behavioral intention to use BL. This part of the findings was consistent with other studies (17, 28, 33, 38). Similarly, Ain et al. (2016) reported that SI has positive effect on use of learning management system (44). University management system, faculty members and students' attitudes are among the factors that constitute the socio-cultural atmosphere in the university. We believe that socio-cultural atmosphere can play a role in supporting and encouraging students to use the BL system.

FC had a significant effect on students' behavioral intention to use BL. However, this construct had no significant effect on students' actual usage of BL. The results of the studies by Abdekhoda et al. (2016) (26) and Tarhni et al. (2017) (27) also showed that FC had no effect on the acceptance of e-learning. In our view, software and hardware infrastructures play a very important role in students' behavioral intent to use a BL. Students must have technological support (such as high-speed internet and advanced computer) to use the BL system. They should also have access to sufficient resources and information about BL. Effective and successful implementation of BL system requires policy making, planning, and infrastructure readiness in information communication and technology (45).

HM had a significant and positive impact on students' behavioral intention to use BL. This was in line with the findings of Tarhni et al. (2017) (27) and Moorthy et al. (2017) (32). For example, Moorthy et al.'s (2017) study showed that HM has significant correlation with behavioral intention to use of mobile learning (32).

Enjoyable learning experiences are an important factor for using BL (46). A user-friendly environment and electronic content (e-content) plays an important role in creating enjoyable learning experiences. Therefore, educational designers should pay attention to these features. This study found that PV has a positive and significant impact on students' behavioral intention to use BL. This result is consistent with the findings of Moorthy et al. (2019) (32). But it was not in line with Tarhni et al. (2017) (27). One of the important indicators for using a technology is its low cost for students. Therefore, economic support for students can play an important role in the adoption of the BL system.

According to another finding of this study, HB had a significant influence on actual usage and behavioral intention to use BL. This was in line with the research of Tarhni (2017) (27) and Moorthy et al. (2017) (32). Venkatesh et al. (2012) (25) revealed that routine use of a technology plays an important role in its adoption. Overall, this study revealed that behavioral intention toward use BL has a significant influence on students' actual usage of BL. This result is consistent with the findings of Suki and Suki (2017) (38), Hoque and Sorwar (2017) (28), Hsu and Hsieh, (2017) (47), and Ravangard et al. (2017) (36). Behavioral intention predicts the actual usage of BL. The actual usage of BL also depends on the students' behavioral intention to use it.

This study had some limitations. The self-reporting scale was used to assess the behavioral intention to use BL. This method of data collection may negatively affect the accuracy of the results. It is suggested that qualitative methods be used in future studies. In this study, we identified some factors affecting the acceptance of BL by UTAUT2 framework. It is suggested to investigate the influence of other factors (such as attitudes to BL, technology anxiety, experience, self-efficacy, compatibility and resistance to change) on behavioral intention to use BL. In addition, it is necessary to analyze the role of moderator variables such as sex, age, experience and voluntariness in future studies. The present study was conducted on students of a university. The findings may not be generalizable to the other universities. Given the infrastructure differences (in term of technological and pedagogical) between universities, we suggest that this study be conducted in other universities and higher education institutions.

Conclusion

The results of the current study revealed that the model designed based on the UTAUT2 framework has good potential for identifying factors influencing the use of BL in medical education. The constructs of PE, EE, SI, FC, HM, PV and HB had a positive and significantly effect on behavioral intention to use of BL. A review of the literature showed that the findings of the study were consistent with some studies. This study provides a good reference for further research on BL in medical education. This study showed that

psychological and social factors play a key role in the behavioral intention to use of BL. Therefore, paying attention to the results of this study can be helpful in designing BL courses in medical education.

Declarations

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Authors' contributions

SMA contributed in designing the proposal, SMA and AK collected the data, NR and SMA contributed to data analyzed. The final manuscript was written by SMA, AK and NR. All authors read and approved the final manuscript.

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Availability of data and materials

The datasets and analyzed during the present research are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

This study was approved by the research ethics committee of KUMS and National Agency for Strategic Research in Medical Education.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Abbreviations

BL: Blended learning; E-learning: Electronic learning; UTAUT2: Unified Theory of Acceptance and Use of Technology 2; PE: Performance expectance; EE: Effort expectance; SI: Social influence; FC: Facilitating conditions; HM: Hedonic motivation; PV: Price value; HA: Habit; BI: Behavioral intention; UB: Use behavior; KUMS: Kermanshah University of Medical Sciences; SPSS: Statistical Package In Social Sciences; AMOS:

Analysis of Moment Structures; FL: Factors loadings; CR: composite reliability; AVE: average variance extracted; CA: Cronbach's alpha; CVI: content validity indices; CVR: Content Validity Ration.

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Tables

Table 1. Demographic characteristic of respondents

Variable	N (%)	
Gender	Male	102 (45.3%)
	Female	123 (54.7%)
Age (years old)	20-22	121 (53.8%)
	23-25	89 (39.6%)
	26≤	15 (6.7%)

Table 2. Measurement model results

Construct	Item	Factor Loading	Cronbach's alpha	CR	AVE
Performance expectancy (PE)	PE1	0.87	0.95	0.931	0.840
	PE2	0.91			
	PE3	0.95			
	PE4	0.92			
	PE5	0.93			
Effort expectancy (EE)	EE1	0.84	0.88	0.893	0.678
	EE2	0.81			
	EE3	0.92			
	EE4	0.71			
Social influence (SI)	SI1	0.87	0.91	0.92	0.748
	SI2	0.95			
	SI3	0.87			
	SI4	0.76			
Facilitating conditions (FC)	FC1	0.86	0.81	0.870	0.692
	FC2	0.88			
	FC3	0.75			
Hedonic motivation (HM)	HM1	0.84	0.82	0.842	0.572
	HM2	0.75			
	HM3	0.73			
	HM4	0.70			
Price value (PV)	PV1	0.94	0.92	0.935	0.828
	PV2	0.89			
	PV3	0.90			
Habit (HT)	HB1	0.86	0.90	0.902	0.698
	HB2	0.86			
	HB3	0.85			
	HB4	0.77			
Behavioral intention (BI)	BI1	0.78	0.82	0.835	0.718

	BI2	0.91			
Use behavior (UB)	UB1	0.71	0.74	0.752	0.604
	UB2	0.84			

Table 3. Discriminant validity results

Construct	PE	EE	SI	FC	HM	PV	HB	BI	UB
PE	0.916								
EE	0.227	0.823							
SI	0.272	0.308	0.864						
FC	0.282	0.140	0.204	0.831					
HM	0.191	0.878	0.262	0.151	0.756				
PV	0.217	0.182	0.053	0.130	0.160	0.909			
HB	0.232	0.607	0.213	0.077	0.550	0.162	0.835		
BI	0.320	0.701	0.310	0.251	0.726	0.217	0.486	0.847	
UB	0.174	0.623	0.241	0.086	0.670	0.096	0.439	0.703	0.777

Figures

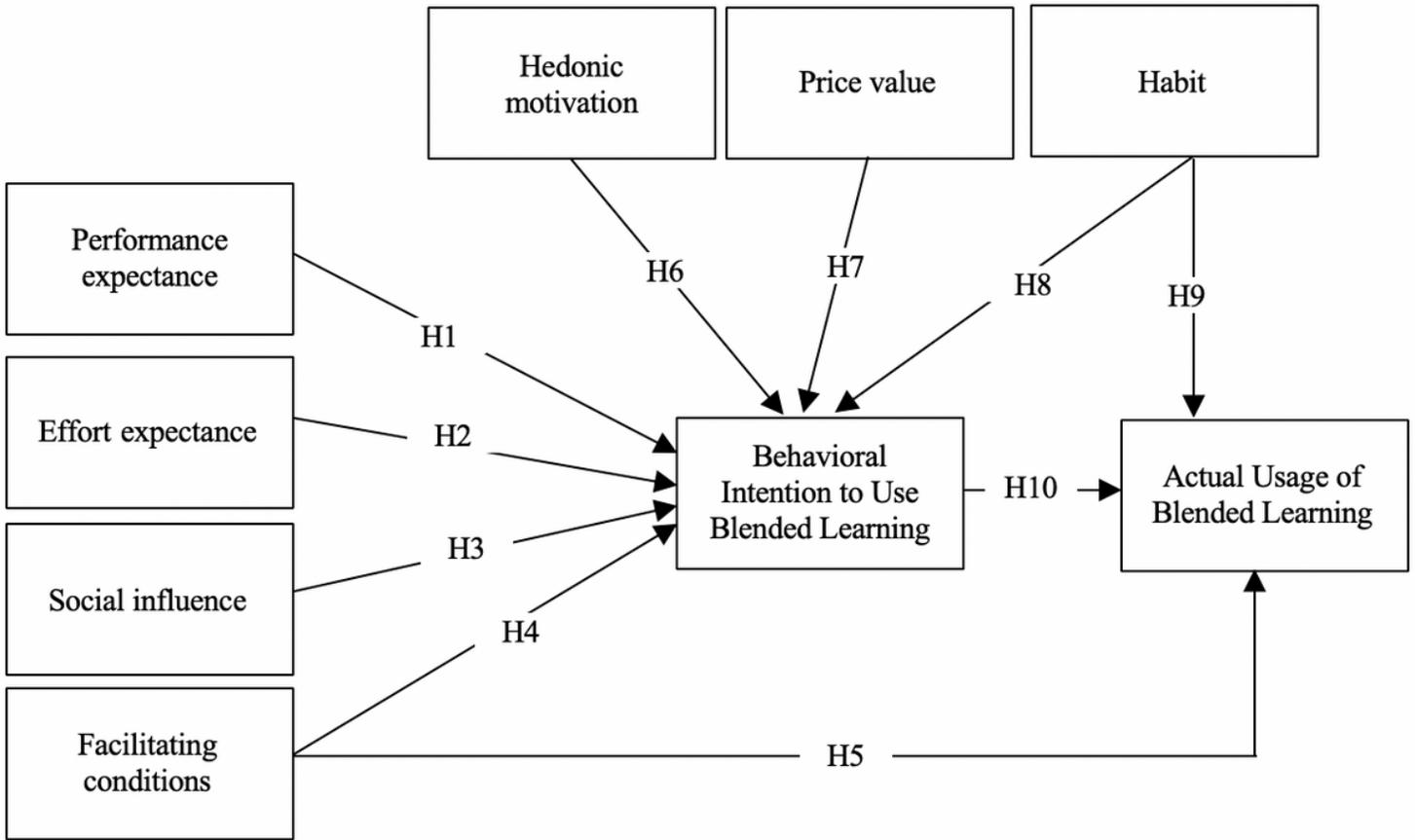


Figure 1

Research Model, adapted from UTAUT2

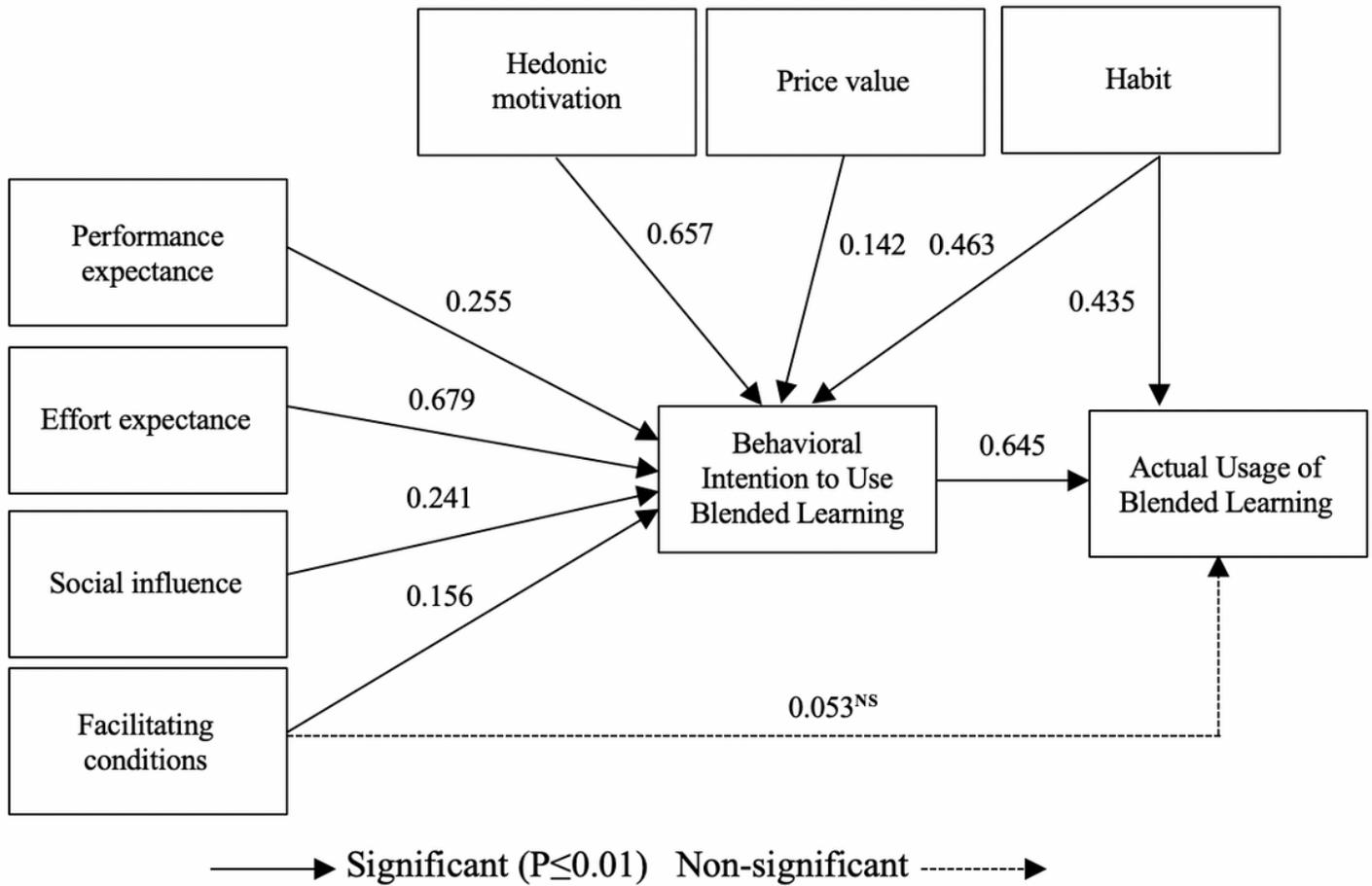


Figure 2

Structural model results