

Received December 8, 2017, accepted January 17, 2018, date of publication February 7, 2018, date of current version March 28, 2018.

Digital Object Identifier 10.1109/ACCESS.2018.2802325

Use of E-Learning by University Students in Malaysian Higher Educational Institutions: A Case in Universiti Teknologi Malaysia

WALEED MUGAHED AL-RAHMI¹, NORMA ALIAS¹, MOHD SHAHIZAN OTHMAN², AHMED IBRAHIM ALZAHHRANI³, OSAMA ALFARRAJ³, ALI ALI SAGED⁴, AND NUR SHAMSIAH ABDUL RAHMAN⁵

¹Faculty of Science, Ibnu Sina Institute for Scientific and Industrial Research, Universiti Teknologi Malaysia, Skudai 81310, Malaysia

²Faculty of Computing, Universiti Teknologi Malaysia, Skudai 81310, Malaysia

³Computer Science Department, Community College, King Saud University, Riyadh 11451, Saudi Arabia

⁴Department of Aqidah and Islamic Thought, Academy of Islamic Studies, University of Malaya, Kuala Lumpur 50603, Malaysia

⁵Faculty of Computer Systems and Software Engineering, University Malaysia Pahang, Gambang 26300, Malaysia

Corresponding author: Norma Alias (norma@ibnusina.utm.my)

This work was supported in part by the Research Management Centre at Universiti Teknologi Malaysia under Grant PY/2015/05399/R.J13000.7826.4F795 and in part by the Deanship of Scientific Research at King Saud University under Grant RG-1438-062.

ABSTRACT This paper examines university students' intention to utilize e-learning. In this paper, we apply and use the theory of a technology acceptance model. We employ the structural equation modeling approach with a SmartPLS software to investigate students' adoption process. Findings indicate that the content of e-learning and self-efficacy has a positive impact and substantially associated with perceived usefulness and student satisfaction, which impact university students' intention to utilize e-learning. Although e-learning has gained acceptance in universities around the world, the study of the intention to use e-learning is still largely unexplored in Malaysia. The developed model is employed to explain the university student's intention to utilize e-learning. The study concludes that university students in Malaysia have positive perceptions toward e-learning and intend to practice it for educational purposes.

INDEX TERMS E-learning, technology acceptance model and higher education.

I. INTRODUCTION

E-learning refers to online learning, which depends on technical-based tuition and training. This type of learning provides students with a virtual environment in which students participate in various activities. These activities include investigation and audiovisual interaction with a variety of subjects. Moreover, e-learning offers students and teachers the chance to interact with each other. In order to identify the important changes in e-learning practices, institutions of education and higher education need to facilitate access of these virtual courses for e-learning [1].

E-learning is different from the traditional ways of learning, such as seminars and classes. This type of learning prefers the individual over group learning as it encourages students to learn individually at home rather than in groups and classes. Therefore, with this type of learning, students attend home-based courses and manage their time depending

on their needs and preferences. They also have the freedom to enroll themselves in other online courses that they find useful. One of the most important characteristics of these online courses is that they involve a variety of activities, and testing that attracts students and keep them focused and involved [2].

The study by [3] reported that this type of learning faces some challenges in terms of its governance. Among these challenges, the lack of manpower and the absence of incentives provided for those in charge of e-learning in institutions adopting this kind of learning received the highest of challenges facing e-learning, with 84.5% and 69.2%, respectively. Regarding the implementation of e-learning, factors such as the need for a clear policy for e-learning, the need for clear governance structure and the need of a more organized distribution of planning responsibilities and implementation received 61.5%, 50% and 42.3%, respectively. Based on the challenges reported by institutions of higher learning, seven

of those universities, or 26.9%, reported that one of the main challenges is the lack of a center or unit in charge of this type of education. Only three institutions, or 11.5% of those included in the study, stated that the lack of attention and support of e-learning from top management is one of the main challenges [4].

“E-learning is the use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services, as well as remote exchange and collaboration” [23], [34], [35]. Several theoretical models are used in related literature to evaluate individuals’ satisfaction with e-learning [15], [16] and a lack of models to evaluate usefulness. In addition, there is a lack of models that have researched understanding using e-learning and how it affects learning performance in Malaysian higher education [34], [35]. Thus, this research focuses on aspects of e-learning in Malaysian higher education by including self-efficacy, the content of e-learning, students’ satisfaction, perceived usefulness and the intention to use e-learning in light of previous related literature, as presented in Sections II and III. The research methodology is described in detail in Section IV. The results and discussion are described in Section V. The conclusion and future work in this area are presented in Section VI

II. USE OF E-LEARNING IN MALAYSIAN HIGHER EDUCATIONAL INSTITUTIONS: UNIVERSITI TEKNOLOGI MALAYSIA

The Centre of Teaching and Learning (CTL) at Universiti Teknologi Malaysia (UTM) is considered one of the main tools for delivering information at the university. Through its informative and creative website, CTL offers e-learning and provides support for various educational and technology-based courses. It also assists in the evaluation and modelling of training courses offered by UTM. One of the important features of CTL is that it is more useful and effective than traditional computer-based instruction in terms of time and distance. This is because its teaching materials are accompanied by internet access to ensure real-time delivery [3].

Back in 1998, strategic planning and aspects of corporate culture as guiding standards were introduced and incorporated into Malaysian public universities. In line with this policy, the evaluation of IT strategies was applied and adopted by UTM through the implementation of the CTL [5]. In line with these developments, UTM started investigating and developing a system for e-learning during the 1998. This development aimed to achieve growth in this field at an international level [5]. As reported on UTM’s main webpage, students report that e-learning is a useful virtual environment for them to upload materials, assignments and slides. It is also a useful tool for them to share knowledge and hold discussions.

The UTM’s e-learning center was developed as an application under the umbrella of the UTM Cyber Campus project, which was implemented back in 1998 by the Ministry of Education. When it was first implemented, e-learning was known

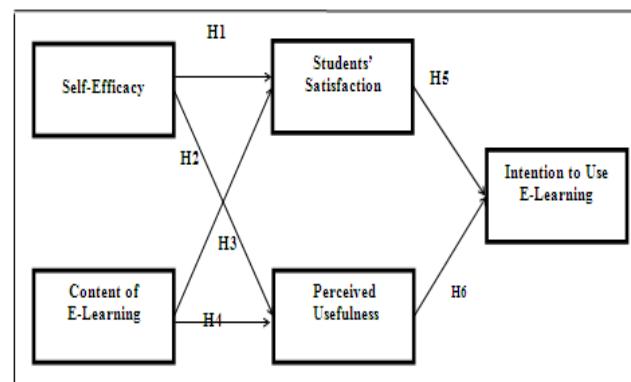


FIGURE 1. The research model and hypotheses.

as virtual learning [3]. The e-learning project assisted students to easily access information on their preferred subjects and interests so that they could increase their level of knowledge on certain subjects. By implementing e-learning, students were granted access to unlimited sources of information and knowledge. To make it easy for students to use e-learning, some application model prototypes were created and developed, such as an examination system, an electronic library, electronic lectures and a cyber cafe [6].

III. RESEARCH MODEL AND HYPOTHESES

Figure 1 below examines some factors related to e-learning. These factors include the content of e-learning and self-efficacy with perceived usefulness and, in turn, students’ satisfaction. These factors are investigated for their impact on students’ intention to engage in e-learning.

Research Hypotheses:

This study examines six hypotheses as illustrated in See Figure 1:

H1: There is a significant relationship between self-efficacy and student satisfaction.

H2: There is a significant relationship between self-efficacy and perceived usefulness.

H3: There is a significant relationship between e-learning content and student satisfaction.

H4: There is a significant relationship between e-learning content and perceived usefulness.

H5: There is a significant relationship between student satisfaction and intention to use e-learning.

H6: There is a significant relationship between perceived usefulness and intention to use e-learning.

A. SELF-EFFICACY

Bandura [41] defines self-efficacy as “People’s judgments of their capabilities to organize and execute courses of action required to attain designated types of performances”. Self-efficacy is reported in literature as an essential factor in understanding the attitude of satisfaction of students towards e-learning [7]. In relation to this, female students were reported to have a low level of self-efficacy [8]. The results

TABLE 1. Loading and cross-loading of items.

No.	Variables	Code	C	SE	PU	SS	IU
1	Content of E-Learning	C1	0.889	0.319	0.339	0.312	0.264
2		C2	0.906	0.271	0.258	0.311	0.202
3		C3	0.778	0.226	0.167	0.255	0.133
4	Self-Efficacy	SE 1	0.273	0.777	0.330	0.368	0.297
5		SE 2	0.273	0.833	0.262	0.352	0.272
6		SE 3	0.223	0.784	0.344	0.356	0.230
7	Perceived Usefulness	PU1	0.191	0.369	0.791	0.352	0.248
8		PU2	0.253	0.280	0.836	0.310	0.354
9		PU3	0.304	0.320	0.818	0.301	0.282
10	Students' Satisfaction	SS1	0.296	0.317	0.312	0.782	0.288
11		SS2	0.211	0.354	0.276	0.825	0.290
12		SS3	0.299	0.389	0.335	0.755	0.282
13	Intention to use E-learning	IU1	0.204	0.286	0.278	0.290	0.775
14		IU2	0.192	0.252	0.323	0.310	0.844
15		IU3	0.171	0.253	0.250	0.256	0.737

of Chen and Chung [9] maintain that self-efficacy in female students is a greater indicator of their acceptance of e-learning than male students. Ong and Lai [10] state that self-efficacy is considered an important indicator of a good e-learning experience.

B. CONTENT OF E-LEARNING

The system of e-learning refers to the tools by which students can gain access to content, which is mainly assignments. The task interaction in which individuals are involved is based on contents of e-learning. These assignments are considered essential for the end-user computing environment like e-learning [11], [12]. It is highly important that students focus on the content rather than the delivery method [34]. One of these views is presented by Doll and Torkzadeh [12], who state that the artifact is the focus of computer-oriented style such as e-learning, while the interaction between the individual and the tasks is the focus of the traditional method. Other studies highlight that some features, such as accessibility and interactivity, can be developed in e-learning courses through the use of technology [13], [14].

C. STUDENTS' SATISFACTION

As for the studies in this field conducted at UTM, some have focused on the concept of communication [17] and strategies for the development of e-learning [18]. Others, such as Razak [18], explores the impact of e-learning at UTM, while others examine the Technology Acceptance Model (TAM) of e-learning at UTM [19]. It has been observed that there is a lack of explanation for student satisfaction. Thus, this study examines other models [15], [16] and aims to develop a model to evaluate individuals' satisfaction with e-learning at UTM.

D. PERCEIVED USEFULNESS

The students' acceptance of e-learning is an essential factor in the application and the use of e-learning inside educational institutions. Special training should be provided for those instructors and teachers who intend to utilize e-learning to assist their teaching. The perspectives and attitudes of teachers towards e-learning were explored in several studies. Masrom [20] and Leem and Lim [21] concluded that perceived usefulness is one essential factor that can impact the level of e-learning participation. Further, perceived usefulness of e-learning is mainly influenced by the teaching materials. Thus, together with the content, perceived usefulness is reported as an indicator of an individual's intention to make use of e-learning [34].

E. INTENTION TO USE E-LEARNING

Perceived usefulness and ease of use are considered factors that can influence behavioral intentions [22], in that both also have an effect on attitude towards usage, despite the fact that perceived ease of use has an impact on perceived usefulness. TAM is normally used to study and explore learners' behavioral intentions. Further, it is suggested that users' continuance intention is highly influenced by their satisfaction, which is mainly measured by perceived usefulness. Thus, in this research we select factors from TAM, because we need to measure usefulness and satisfaction with regards to intention to use e-learning.

Pituch and Lee [24] reported that there is no relationship between self-efficacy, usefulness and intention to use e-learning. Basically, TAM framework studies highlight three important factors, namely perceived usefulness, ease of use and intention to use. These factors have proved to be high predictors of e-learning satisfaction [25].

TABLE 2. Constructs, items, and confirmatory factor analysis results.

Code	Constructs and items	Factors Loading	Cronbach's Alpha	Composite Reliability	AVE
Content of E-learning [16]					
C 1	The e-learning system provides up-to-date content.	0.889	0.825	0.894	0.739
C 2	The e-learning system provides useful content.	0.906			
C 3	The e-learning system provides sufficient content.	0.778			
Self-Efficacy of E-learning [17]					
SE 1	I feel confident using the e-learning system.	0.777			
SE 2	I feel confident operating e-learning functions.	0.833	0.715	0.840	0.637
SE 3	I feel confident using e-learning contents.	0.784			
Perceived Usefulness [38]					
PU 1	E-learning helps me to be self-reliable.	0.791			
PU 2	E-learning helps to improve my knowledge.	0.836	0.747	0.865	0.664
PU 3	E-learning is effective.	0.818			
Students' Satisfaction [39]					
SS 1	E-learning is enjoyable.	0.782			
SS 2	I am pleased enough with the e-learning system.	0.825	0.694	0.831	0.621
SS 3	E-learning satisfies my educational needs.	0.755			
Intention to Use E-learning [40]					
IU 1	I tend to use the e-learning system.	0.775			
IU 2	I believe that use of e-learning is available.	0.844	0.691	0.829	0.619
IU 3	I am likely to use the e-learning system in the future.	0.737			

IV. RESEARCH METHODOLOGY

A questionnaire, overseen by an enumerator, was used to collect data from different students with different nationalities. Partial least square structural equations modelling (PLS-SEM), using SmartPLS 3.0, was first used to measure the reliability as well as the validity of the model. To develop a model analyzing e-learning use that can be applied and managed a suitable methodology is employed to guide this inquiry. The current paper uses a quantitative research design based on questionnaires as the main instrument of data collection. According to Krejcie and Morgan [42], the recommended sample constituted 106 respondents from the Faculty of Computing at UTM. Therefore, 106 questionnaires were distributed among undergraduate students for a random sampling. SPSS, Version 20, and SmartPLS software were used as the two main tools of analysis. The instrument of data collection was developed based on the study objectives as well as models in related literature [16], [17], [35].

Before conducting the main study, a pilot study was conducted, and Cronbach's alpha was found to be 0.817, which reflects a good level of reliability. The questionnaires utilized a five-point Likert scale. The scale scored the students' agreement, which ranged from (1), meaning "strongly disagree," to (5), meaning "strongly agree." Hair et al. [27] maintain that it is important to exclude outliers, as they might cause the results to be inaccurate. Most of the participants were

females (55.0%) with males forming only 45.0% of the participants. The questionnaire, which consisted of 15 items, was distributed among the students. Table 2 illustrates the results.

V. RESULTS AND DISCUSSION

Prior to testing of the hypotheses, composite reliability, Cronbach's alpha and convergence validity were calculated to test the construct validity. Based on the recommendations of Fornell and Larcker [26], discriminant validity was also tested through the use of a criterion test.

A. CONSTRUCT VALIDITY OF MEASUREMENTS

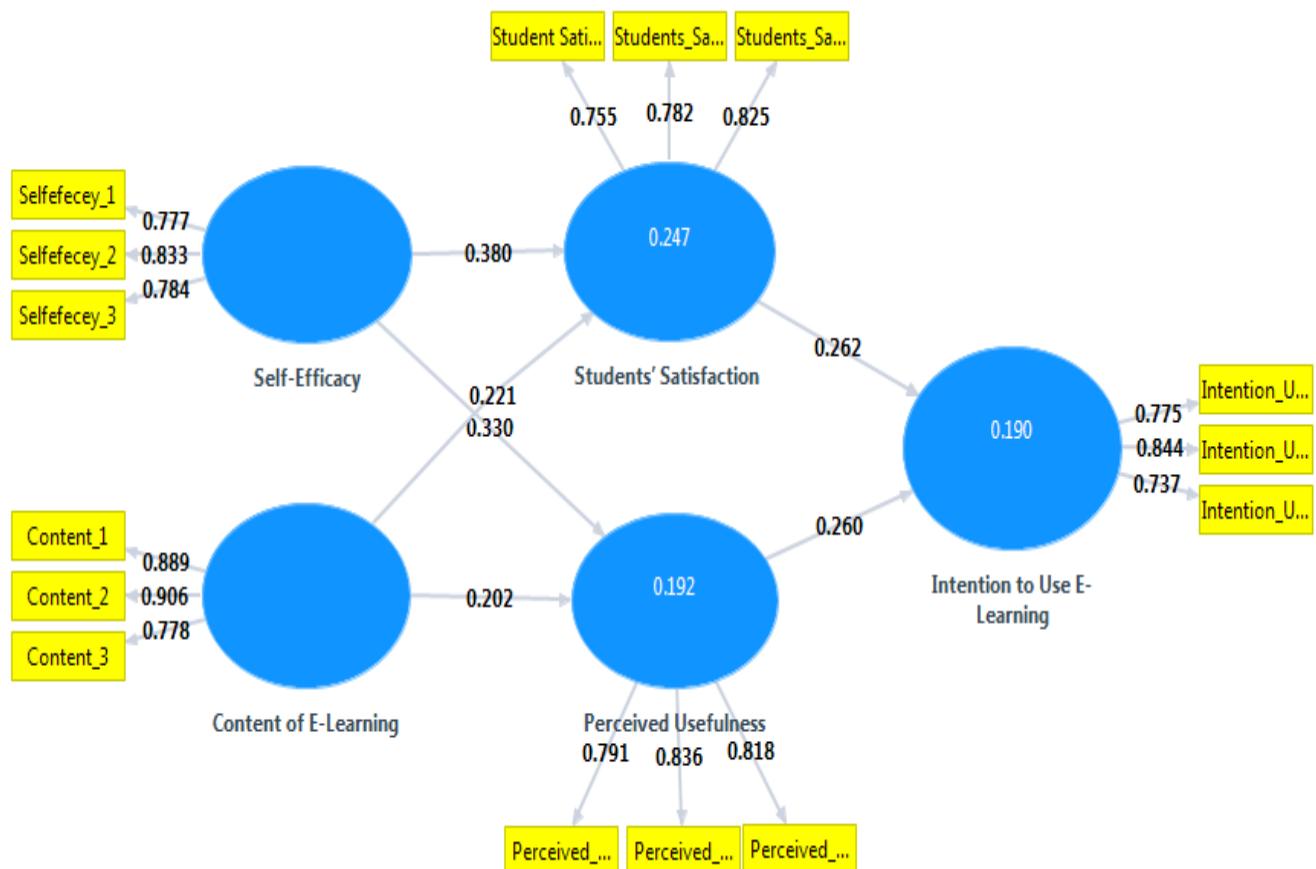
Construct validity indicates the extent to which certain items measure the concept they are designed to measure [27]. This was established by a systematic literature review of items developed and tested by other researchers. Items were observed to be properly assigned to their constructs through their loadings as presented in Table 1. Chow et al. [28] highlight that items should significantly load to the construct they are designed to measure.

B. CONVERGENT VALIDITY OF MEASUREMENTS

The resulting values of composite reliability were in the recommended range, which is above 0.70. These values ranged from 0.829 to 0.894. The Cronbach values also ranged

TABLE 3. Discriminant validity.

Constructs	C	IU	PU	SE	SS
Content of E-learning (C)	0.860				
Intention to Use E-learning (IU)	0.241	0.787			
Perceived Usefulness (PU)	0.307	0.363	0.815		
Self-Efficacy of E-learning (SE)	0.231	0.334	0.394	0.798	
Students' Satisfaction (SS)	0.343	0.364	0.393	0.451	0.788

**FIGURE 2.** Path coefficients results.

from 0.691 to 0.825, which means that they were within the recommended range. Average variance extracted (AVE) was also above the recommended value of 0.5, ranging from 0.619 to 0.739. The results of confirmatory factor analysis (CFA) of the measurement model are illustrated in Table 2.

C. DISCRIMINANT VALIDITY OF MEASUREMENTS

Discriminant validity refers to the level of difference between the sets of concepts and their own indicators. The AVE value was well above 0.50 and was significant at $p = 0.001$, and this indicates that discriminant validity was supported for all constructs [26]. In this regard, Hair et al. [27] explain that the correlations between items in two constructs should not exceed the square root of the average variance shared by a single construct's items (See Table 3).

D. ANALYSIS OF THE STRUCTURAL MODEL

At this stage, the study began to test and examine the research hypotheses, which revolved around the relation between the constructs. To achieve this objective, the PLS algorithm was conducted using SmartPLS 3.0. Figure 1 illustrates the resulting path coefficients while Figures 2 and 3 represent the results of these hypotheses.

Regarding the first hypothesis, the relation between self-efficacy and students' e-learning satisfaction is positive and significant ($\beta = 0.380$, $t = 7.107$, $p < 0.001$). Thus, the results positively support the first hypothesis. The second hypothesis is also supported as analysis shows a positive relationship between self-efficacy and perceived usefulness ($\beta = 0.330$, $t = 5.292$, $p < 0.001$). The third hypothesis is also positively supported, as there is a significant relationship

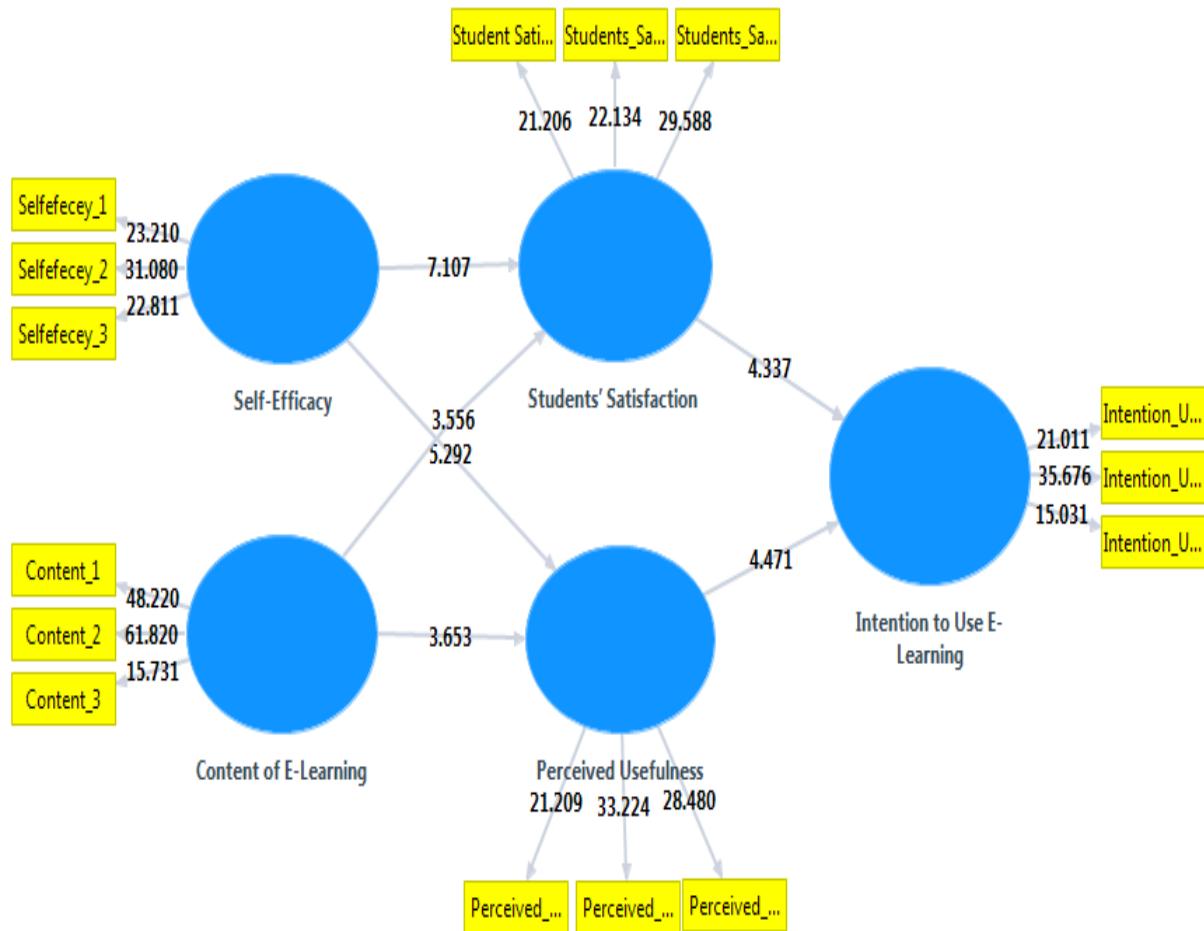


FIGURE 3. Path coefficients T values.

between e-learning and student satisfaction ($\beta = 0.221$, $t = 3.556$, $p < 0.001$). Similarly, the fourth hypothesis on the relationship between e-learning and perceived usefulness, this relation is positive and significant ($\beta = 0.202$, $t = 3.653$, $p < 0.001$). Thus, the fourth hypothesis is also supported by the results of the current study. Along these lines, the results indicate that there is a significant relationship between student satisfaction and intention to use e-learning ($\beta = 0.262$, $t = 4.337$, $p < 0.001$), which supports the fifth hypothesis. As for the final hypothesis, the relationship between perceived usefulness and the intention to use e-learning is significant ($\beta = 0.260$, $t = 4.471$, $p < 0.001$). Results are presented in Table 4.

E. DISCUSSION

The current study represents one effort in the field of e-learning to uncover the relationship between usefulness and student satisfaction and their impact on learners' intention to use such technology at UTM. Further, self-efficacy and content of e-learning are two important factors related to e-learning, and the intention to use this technology depends on perceived usefulness and satisfaction of the students.

These results are supported by previous related literature on the relationships among these factors [21], [35]. E-learning assists students in higher education to complete various tasks and research. It's also considered a useful tool for assessing their academic achievement. Other studies on the use of Internet in higher education, such as the studies on social media, e-learning and massive online open courses, support and urge for the use of these applications in educational contexts [30]–[32].

Meier [33] offers a practical study on the benefits of using the Internet for educational purposes. The study is about the experiences of students in South African schools as they exchange and share knowledge with their Finnish counterparts. Instructors can utilize the characteristics of e-learning during their presentations and in their classes. They can get access to the syllabus, lecture notes, tutorials, exercises, assignments and even tests. E-learning provides students with access to a huge amount of information, such as web-based video media, audio, presentation materials and chats.

Perceived usefulness is considered one of the key indicators of intention to use e-learning. Research supports that

TABLE 4. Hypotheses testing.

H	Independent	Relationship	Dependent	Path	S.E.	T. Value	P. Value	Result
H1	SE	→	SS	0.380	0.053	7.107	0.000	Supported
H2	SE	→	PU	0.330	0.062	5.292	0.000	Supported
H3	C	→	SS	0.221	0.062	3.556	0.000	Supported
H4	C	→	PU	0.202	0.055	3.653	0.000	Supported
H5	SS	→	IU	0.262	0.060	4.337	0.000	Supported
H6	PU	→	IU	0.260	0.058	4.471	0.000	Supported

Note: SE: standard error

intention to use e-learning is positively influenced as users find out that e-learning is easy to use and useful [34]. One of the most important advantages of e-learning is that it assesses success in a variety of educational environments [23]. In other words, e-learning has the advantage of evaluating educational contents as beneficial for students. Therefore, students can take this content into consideration [35]. Another study by Chaka and Govender [36] also reports a significant relationship between mobile learning conditions and behavioral intention. Other research shows a different opinion. The study by Krajnc [37], for example, maintains that use of e-learning within the educational environment puts much responsibility on learners and consumes their time. As for the current study, factors proved to be predictors of students' intention to use e-learning systems. Hence, the theoretical framework of this study contributes to the development of constructs of usefulness and satisfaction in related to intention to use e-learning through employing a rigors approach structural equation model. In addition to the usefulness of e-learning, both the content of e-learning and how it is delivered are of equal importance. It is considered essential to look at how this content is offered and presented to the students [35]. Moreover, this content needs to be up-to-date for students to use. Users of e-learning are reported to be more likely to have access to the huge store of blended learning courses, and this is normally in line with the content of their field of study [13].

VI. CONCLUSION

The current research is on the effectiveness of e-learning at UTM. This study has six hypotheses, and they are all supported and verified. There is a significant relationship between the factors proposed in the hypotheses, such as satisfaction and perceived usefulness, and the intention of using e-learning among university students. E-learning enables students to share knowledge and interact with their peers and instructors.

Self-efficacy, content of e-learning, student satisfaction and perceived usefulness are the four main factors that the current study investigates, and they proved to be the key predictors of learners' intention to use e-learning. The interface of e-learning and the way it is designed motivates students, leading to better participation rates. E-learning interface makes it easy for the students to access and explore course content. It also enables them to easily use various

functions and encourages them to make use of e-learning technology.

It is recommended that future research build on the current work and investigate more aspects related to the creation of e-learning environments. Moreover, future research might look at the influence of student characteristics and the quality of services on the individual's intention to engage in e-learning. Such aspects include the support for e-learning and its relationship to self-efficacy. Such studies should aim at improving student satisfaction with e-learning, which is a key factor for increasing the learner's intention to use this technology. Students' academic experience at UTM was also observed to be influenced by e-learning on the condition that learners control their time of use.

Future studies are recommended to consider other factors, especially those related to collaborative learning, as a means of improving the academic performance of students in institutions of higher education. Further, studies should focus on demographic factors and increase the sample under investigation. Future research should consider involving users other than students, such as instructors and supervisors. Such investigations should employ interviews to enrich data and findings. Finally, focusing on how e-learning influences students' performance and engagement, with an emphasis on interactivity and collaborative learning are also suggested.

ACKNOWLEDGEMENTS

The authors also would like to thank the Ibnu Sina Institute for Scientific and Industrial Research (ISI-SIR), Faculty of Science, Universiti Teknologi Malaysia.

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WALEED MUGAHED AL-RAHMI received the Ph.D. degree from the Faculty of Computing-Information Systems, Universiti Teknologi Malaysia (UTM). He had eight years of teaching experience at the Department of Computer Science, Hodeidah University. He was a Teaching Assistant with the Faculty of Computing, UTM, for two and half years. He also held a post-doctoral position at the Faculty of information and Communication Technology, International Islamic University Malaysia. He currently holds a post-doctoral position at the Faculty of Science, UTM. His research interests are information system management, human-computer interaction, implementation process, impact of social media networks, collaborative learning, E-learning, knowledge management, massive open online course, and statistical data analysis (IBM SPSS, AMOS, NVIVO, and SmartPLS). He received the Best Student Award for his Ph.D. degree, excellent academic achievement in conjunction with the 56nd Convocation Ceremony, UTM, in 2016.



NORMA ALIAS received the B.Sc. degree in mathematics and the M.Sc. degree in industrial computing from Universiti Kebangsaan Malaysia (UKM) in 1991 and 1997, respectively, and the Ph.D. degree in industrial computing (parallel computing) from UKM. She is currently a Senior Lecturer with the Faculty of Computer Science and Information Systems, Universiti Teknologi Malaysia. Her research interests are computational nanotechnology, high-performance computing, and big data implementation and numerical analysis.



MOHD SHAHIZAN OTHMAN received the B.Sc. degree in computer science with specialization in information systems from Universiti Teknologi Malaysia (UTM) in 1998, and the M.Sc. degree in information technology and the Ph.D. degree in Web information extract information retrieval and machine learning from Universiti Kebangsaan Malaysia. He is currently a Senior Lecturer with the Faculty of Computer Science and Information Systems, UTM. His research interests are information extraction, information retrieval on the Web, Web data mining, content management, and machine learning.



ALI ALI SAGED received the Ph.D. degree from University of Malaya. He is currently an Associate Professor with the Department of Akidah And Islamic Thought, Academy of Islamic Studies, University of Malaya. His current research interests include social science.



AHMED IBRAHIM ALZAHHRANI received the master's degree in computer science in USA and the Ph.D. degree in computing science in U.K. He is currently an Assistant Professor and the Head of the Informatics Research Group, Computer Science Department, Community College, King Saud University. His main research interests span over IT diffusion and innovation, information technology management, human behavior modeling in technology usage, online social networks, and human-computer interaction using cognitive research.



OSAMA ALFARRAJ received the master's and Ph.D. degrees in information and communication technology (ICT) from Griffith University in 2008 and 2013, respectively. His doctoral dissertation investigates the factors influencing the development of eGovernment in Saudi Arabia, and it is a qualitative investigation of the developers' perspectives. He is currently an Assistant Professor of ICT at King Saud University, Riyadh, Saudi Arabia, where he is also a Faculty Member of the Computer Science Department, Community College. His research interests include electronic commerce, M-government, and the eHealth systems.



NUR SHAMSIAH ABDUL RAHMAN received the bachelor's degree in computer science from Universiti Teknologi Malaysia (UTM) in 2007, the master's degree in educational technology from the Faculty of Education, UTM, in 2009, and the Ph.D. degree from the Faculty of Computing, UTM, in 2017. Her research interests include human-computer interaction, such as social media use, implementation process, E-Learning, collaborative learning, and constructivism theory and technology adoption.

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