



Examining Blended Learning Adoption Towards Improving Learning Performance in Institutions of Higher Education

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Accepted: 3 December 2023
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Abstract

Institutions of higher education are implementing Blended Learning (BL) approaches to supplement traditional courses in enhancing students' learning experiences. However, only fewer studies have examined BL acceptance based on the determinants that influence students' perception towards BL integration in improving learning performance. Accordingly, this study employs the theory of Technology Acceptance Model (TAM) and Information System (IS) success model to develop a model to examine the determinants that influence students' perception towards BL integration and acceptance as a mode of study to improve learning performance. Survey questionnaire was designed, and data was gathered from 1169 students to empirically validate the designed model. Accordingly, Partial Least Square-Structural Equation Modeling (PLS-SEM) was applied to analyze the survey data. The results suggest that system quality, information quality, and service quality significantly impact students' acceptance of BL. Moreover, results reveal that perceived usefulness of BL, perceived ease of use of BL, attitude towards using BL, intention to use BL, and actual use of BL were proven to be key determinants that should be considered in improving students' acceptance of BL. Additionally, results indicate that students' acceptance of BL significantly influences learning performance. Implications from this study provide insights on how institutions can improve students' integration of BL initiatives in both physical and digital learning environments.

Keywords Technology mediated learning · Blended learning integration · Technology acceptance model · IS success model · Student performance · Institutions of higher education

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1 Introduction

In today's world, the conventional teaching method is only beneficial to some extent in improving learning. Collaboration, interaction, and teamwork are essential to achieve an effective learning environment (Wong et al., 2014). In order to address this, institutions of higher education all around the world are required to deploy engaging and innovative approaches to improve the motivation and learning satisfaction of their students (Aguti et al., 2014). To address this, institutions of higher education around the world are required to deploy innovative approaches to improve students learning (Anthony et al., 2019). Accordingly, universities, colleges, and polytechnics are now utilizing Information and Communications Technology (ICT) based learning such as Blended Learning (BL) approach to deliver curriculum content. BL has been growing in reputation and demand and has emerged as a common approach adopted in institutions. BL entails the combination of conventional Face-to-Face (F2F) teaching and digital teaching and has presently been implemented in institutions as it has the advantages of both conventional and digital delivery approach (Antwi-Boampong & Bokolo, 2021; Yeou, 2016).

Findings from recent studies (Baragash & Al-Samarraie, 2018) suggest that the integration of BL method improves learners' engagement and understanding as it forms positive impact on learners' perceptions regarding the learning environment. In fact, Graham et al. (2013) state that BL will become the new course delivery model that employs different media resources to strengthen the interaction among students. Currently, BL implementation is a growing trend for lecturers and students in Malaysia institutes because of the usefulness of BL as an alternative educational method. But at the moment, prior research investigated the deployment of BL by comparing the conventional educational and fully digital mode in relation to learners' accomplishment. However, very few studies studied learners' acceptance and integration of BL approach in improving learning performance in Malaysian context.

Thus, there is a need for research to investigate the determinants that impacts the perception of students towards BL integration (Anthony et al., 2019). Moreover, Anthony et al. (2019) stated that there are limited studies that explored BL integration, where such studies are important for assessing the impact of BL on students learning performance (Anthony Jnr, 2021; Bouilheres et al., 2020; Ghazal et al., 2018). Similarly, Isa et al. (2015) mentioned that the level of students' perception and acceptance for self-directed learners for adoption in BL environment is still lacking and less understood. Thus, there is a need for research to assess the factors that influence the perception of students towards BL integration (Aguti et al., 2014). Given the above insights, it is apparent that there is need to investigate current BL approach integrated in institutions to improve learning performance (Baragash & Al-Samarraie, 2018; Kundu et al., 2021), and examine the determinants that influence student's perception towards BL acceptance. Therefore, based on the aforementioned discussions, the objectives of the present study are as follows:

- To identify how BL approach integrated by students can be enhanced.
- To investigate the determinants that influence student perception towards BL acceptance.
- To explore how student learning performance can be improved in BL environment.

To achieve the following objectives, this study examines how BL initiatives influences students' learning performance and also investigate the determinants that influence

students' perception in accepting BL environment as a learning approach in institutions of higher education as suggested by Ekawati et al. (2017). Therefore, this study aims to investigate the determinants that influence student perception towards BL acceptance and to identify how learning performance can be enhanced via BL integration. To achieve the following objective, this research develops a model based on Technology Acceptance Model (TAM) and Information Systems (IS) success model to examine students' perception towards the acceptance of BL and the integration of BL initiatives on students' learning performance. The remainder of the paper is structured as follows. Section 2 is the literature review. Section 3 is the model and hypotheses development, and Sect. 4 describes the research methodology. Section 5 is the results and discussion, Sect. 6 is the implications of study, and Sect. 7 is the conclusion.

2 Literature Review

2.1 Overview of Blended Learning and Hybrid Learning

The significance of ICT for education is increasing as the year progresses for institutions. As such digital learning platforms are being adopted such as MOOC as suggested in the literature (Cheng et al., 2017; Liu et al., 2018) to facilitate online learning by employing (e.g., Small Private Online Course (SPOCs)) to improve learning. Learning has mostly been traditionally linked with face-to-face (F2F) presence of classrooms, pen-and-paper, textbooks, physical teachers, and examinations (Anthony et al., 2022). However, ICT has rapidly transformed learning by supporting teaching using various technologies. An integration of ICT through internet-enabled tools such as Blackboard with methods such as on-campus classroom is referred to as blended learning (Bokolo Jr et al., 2020; Gaol & Hutagalung, 2020; Monk et al., 2020). Academics such as Lothridge et al. (2016) recommends that a successful delivery of BL encompasses of 80% online learning followed by 20% classroom instruction that relates to online content.

Additionally, BL moves the focus from teaching centric to learning based which support students to become more engaged in the educational process and more interested and, as a result, it improves their perseverance and commitment (Aguti et al., 2014; Sari & Karsen, 2016). Thus, in universities, colleges, and polytechnics BL integration usually involves F2F and other corresponding online learning delivery methods. Normally, students attend traditional lecturer-directed F2F classes with computer mediated tools to create a BL environment in gaining experiences and also promote learners' learning success and engagement (Baragash & Al-Samarraie, 2018). Moreover, BL provide motivating and meaningful learning through different asynchronous and synchronous teaching strategies such as forums, social networking, live chats, webinars, blog, etc. that provides more opportunities for reflection and feedback from students (Dakduk et al., 2018; Vanslambrouck et al., 2019).

According to Baragash and Al-Samarraie (2018) BL initiatives integrated in institutions will result to different learning outcomes. However, research on the outcomes on students' learning performance, particularly in integrating synchronous and asynchronous blended initiatives, have not been adequately researched. Thus, it is assumed that learners' perception to accept integrating BL and its impact on their learning performance in the context of institutions of higher education has not been sufficiently investigated. Correspondingly, inadequate attention has been paid to students' attitude and intention to accept certain BL

delivery modes (Baragash & Al-Samarraie, 2018; Ghazal et al., 2018). Correspondingly, Anthony et al. (2019) maintains that online learning in BL approach should be not less than 20% nor more than 79%. Accordingly, Fig. 1 illustrates information about BL approach required to understand F2F and online components for BL integration.

Figure 1 depicts F2F and online learning activities. Online activities comprise of learning resources such as reference material, reading materials, discussion forum, simulations, wordbook, message board, web links, tutorials, quizzes, online writing tool, etc. (Anthony et al., 2019). On the other hand, physical teaching entails laboratory activities, discussions, individual/group, lectures, presentation, and assessment skill practices carried out for the teacher to investigate the educational performance of the learners.

2.2 Background of TAM and IS Success Model

2.2.1 Overview of TAM

To examine the determinants that influence users' acceptance of technology, researchers such as Yeou (2016); Ghazal et al. (2018) employ theories and models from social psychology and Information Systems (IS). Among these theories employed is the Technology Acceptance Model (TAM) designed by Davis (1989), Theory of Planned Behaviour (TPB) founded by Ajzen and Fishbein (1980); Fishbein and Ajzen (1975), and Unified Theory of Acceptance and Use of Technology (UTAUT) developed by Venkatesh et al. (2003). These theories are the most extensively adopted in investigating technology acceptance in educational domain. However, TAM is the most adopted theory employed to examine BL acceptance (Mohammadi, 2015), because TAM is precisely proposed for predicting and describing user acceptance of a particular technology (Ghazal et al., 2018). TAM was proposed from the Theory of Reasoned Action (TRA) by Ajzen and Fishbein (1980) by Davis (1989) to investigate users' acceptance of deployed IS. TAM main construct comprises of perceived ease of use, perceived usefulness, attitude towards use, behavior intention to use, and actual system use which impacts users' acceptance of technology (Teo, 2019).

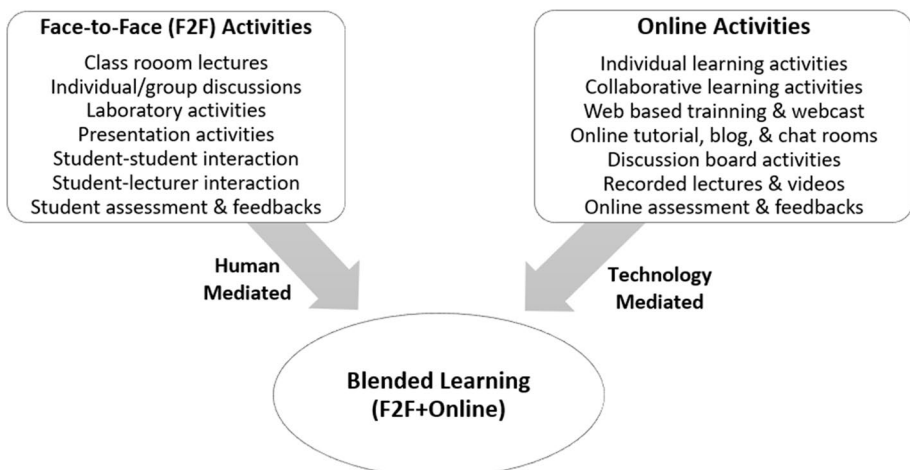


Fig. 1 Blended learning activities adapted from Jnr (2021)

2.2.2 Background of Information Systems Success Model

The information system success model was first designed by DeLone and McLean in the year 1992 to explore information system success (DeLone & McLean, 2003). The model was revised and improved in 2003 to cater for the changing role of IS (Lin & Wang, 2012). Accordingly, the extended IS success model comprised of information quality, system quality, service quality, intention to use, user satisfaction, and net benefits as the main constructs (DeLone & McLean, 2003; Hsu, 2023). The information system success model is one of the most employed models to examine success of IS adoption (Hassanzadeh et al., 2012). Similarly, since BL approaches are specific type of IS, the IS success model can be employed for evaluating the success of BL integration in this research as previously employed by prior BL studies (Al-Busaidi, 2012; Ghazal et al., 2018; Hassanzadeh et al., 2012; Lin & Wang, 2012; Mohammadi, 2015; Ozkan & Koseler, 2009; Tahar et al., 2013).

However, student perception and support for accepting BL approaches for learning is still lacking irrespective of the increasing number of innovative approaches employed in BL environments (Anthony Jnr et al., 2023; Ismail et al., 2018). Previous studies (Ahmed, 2010; Al-Busaidi, 2012; Al-Rahmi et al., 2018; Fisher et al., 2018; Ghazal et al., 2017, 2018; Gong et al., 2004; Hassanzadeh et al., 2012; Isa et al., 2015; Ismail et al., 2018; Lin & Wang, 2012; Mohammadi, 2015; Ozkan & Koseler, 2009; Padilla-Meléndez et al., 2013; Tahar et al., 2013; Teo, 2019; Tselios et al., 2011; Yeou, 2016) employed TAM and/or IS success model to investigate the relationship between variables that influence students use of BL.

Notwithstanding of these studies, there are fewer research that explore the variables contributes to the enhancing learners' learning performance (Ghazal et al., 2018; König et al., 2023). As need for BL approaches by institutions continue to expand, it is important to identify the influential determinants related to learners' perceptions of BL integration and BL acceptance. This is because the outcome of BL integration relies on its sustained usage and satisfaction of students. Thus, it is essential to investigate the significant determinants vital for supporting learning (Ghazal et al., 2018). Therefore, empirical research is needed to clearly explore how certain variables can promote students' mindset of BL. Consequently, this study designs a model founded on TAM and IS success model similar to prior studies (Al-Busaidi, 2012; Ghazal et al., 2018) to present a model to examine the determinants that influence students' perception towards BL acceptance and BL integration as a mode of study to improve learning performance.

2.3 Related Works

The significance of ICT for education is increasing as the year progresses for institutions. However, student perception and support for accepting BL approaches for learning is still lacking irrespective of the increasing number of innovative approaches employed in BL environments (Ismail et al., 2018). This sub-section reviews prior studies that employed TAM and IS success model to examine BL acceptance in institutions of higher education. The selected studies are presented in Table 1.

Table 1 indicates that previous studies (Gong et al., 2004; Ozkan & Koseler, 2009; Ahmed, 2010; Tselios et al., 2011; Al-Busaidi, 2012; Hassanzadeh et al., 2012; Lin & Wang, 2012; Tahar et al., 2013; Padilla-Meléndez et al., 2013; Isa et al., 2015; Mohammadi, 2015; Yeou, 2016; Ghazal et al., 2017, 2018; Al-Rahmi et al., 2018; Fisher et al.,

Table 1 Prior studies that employed TAM and/or IS success model for BL acceptance

Authors & Contribution	Purpose/Aim	Theory	Employed Constructs	Methods
Al-Rahmi et al. (2018) explored university learners' intention to use e-learning	Motivated to examine the adoption process employed by students in learning	TAM	Content of e-learning, self-efficacy, perceived usefulness, students' satisfaction, and intention to use e-learning	Questionnaire was used to collect data from 106 students and PLS-SEM was employed for analysis
Fisher et al. (2018) investigated the significant relationship between flipped and BL student satisfaction, engagement, and performance	Focused on testing if BL positively mediates student performance and engagement in flipped subject learning	TAM	BL benefits, Engagement with Flipped Learning, Perceived Performance, and Overall satisfaction	Data was collected using survey from 348 students. Employed factor and Path model analysis
Ghazal et al. (2018) developed a model that comprises of factors that improves students' satisfaction and experience in BL environment	Aimed to provide insights for universities towards supporting students' adoption of BL approach	TAM and IS success model	Students, instructors, system (system quality, information quality, course design, organization, perceived ease of use, perceived usefulness, and satisfaction)	Data was collected using online questionnaire from 174 university students. PLS was employed for analysis
Ismail et al. (2018) explored the acceptance of Massive Open Online Courses (MOOC) among students	The authors aimed to identify the criteria that enhance MOOC in BL environment and also improve the teaching and learning quality	TAM	Perceived of usefulness, perceived ease of use, user attitude toward use, and actual system use	Data was collected using questionnaire from 60 randomly selected students. Descriptive analysis was employed
Teo (2019) investigated students and lecturers' intention to use technology for teaching and learning	Aimed to explain the intention of learners and teachers to utilize technology	TAM	Perceived usefulness, perceived ease of use, attitude toward use, facilitating conditions, computer self-efficacy, and intention to use technology	Data was collected using survey from 503 learners and 592 lecturers. SEM was employed for analysis
Ghazal et al. (2017) presented the important factors that determine students' acceptance and satisfaction in a BL environment	Targeted to provide an inclusive examination of the key factors that impact students' usage of Learning Management System (LMS)	IS success model	Technology experiences, information quality, service quality, system quality, perceived ease of use, perceived usefulness, and student satisfaction	Data was collected using online questionnaire from 174 university students. PLS was employed for analysis

Table 1 (continued)

Authors & Contribution	Purpose/Aim	Theory	Employed Constructs	Methods
Yeou (2016) investigated learners' acceptance of Moodle in a BL environment	Focused to explore university student's attitudes towards implementing Moodle for learning	TAM	Perceived usefulness, perceived ease of use, attitude, computer self-efficacy, intention to use, frequency of use	Data was collected using questionnaire from 47 students and PLS was employed for analysis
Isa et al. (2015) investigated the main factors that influence student adopting m-learning	Deployed the relationship among the factors that encourage m-learning adoption among self-directed students	TAM	Perceived near-term usefulness, perceived ease of use, personal innovativeness, and perceived long-term usefulness	Data was collected using questionnaire from 190 respondents. Spearman's rank order correlation analysis was employed
Mohammadi (2015) designed a model to investigate students' perspectives of e-learning	Aimed to assess the impact of perceived ease of use, quality feature, and perceived usefulness on students' intentions and satisfaction based on the usability use of e-learning	IS success model	Educational quality, service quality, technical system quality, information quality, perceived ease of use, perceived usefulness, satisfaction, intention to use, and actual use	Survey data was collected from 390 randomly selected samples and SEM was employed for data analysis
Padilla-Meléndez et al. (2013) explored if perceived playfulness has an influence on gender differences in relation to BL acceptance of students	Intended to re-examine the impact of gender differences on technology acceptance, use, and perceived playfulness in the context of a BL setting	TAM	Perceived playfulness, perceived ease of use, attitude, and intention to use	Data was collected using survey from 484 students. Descriptive, dimensionality, and factor analysis was carried out
Tahar et al. (2013) examined factors that influence learners' satisfaction towards BL	Identified factors to be employed as guideline for universities to implement BL approach for teaching and learning	IS success model	Service quality, information quality, system quality, intention of use, and satisfaction	Data was collected using questionnaire from 75 students. Factors analysis was employed
Al-Busaidi (2012) examined the important variables that influence students' perception towards successful LMS implementation in BL	Aimed to explore how identified factors impacts learners' continuous intention to implement LMS for BL	TAM and IS success model	LMS (system quality, information quality, and service quality), classmates, course, organization, learner, instructor, perceived usefulness, perceived ease of use, system use, user satisfaction, continuous intention to use	Data was collected from 512 students and analyzed using SEM approach

Table 1 (continued)

Authors & Contribution	Purpose/Aim	Theory	Employed Constructs	Methods
Hassanzadeh et al. (2012) developed a model for assessing e-learning success adoption in universities	Intended to facilitate planning and providing enjoyment benefits to students and lecturers using e-learning systems	IS success model	Technical system quality, content and information quality, service quality, intention to use, user satisfaction, use of system, loyalty to system, benefit of using system, and goals achievement	Survey data was collected from 369 instructors, students and alumni. SEM was employed for data analysis
Lin and Wang (2012) examined the relationship between system factors and perceived fit factors that motivate students to continue use e-learning in BL setting	Aimed to investigating the important features that e-learning can offer in improving learning	IS success model	Information quality, knowledge quality, system quality, task-technology fit, perceived usefulness, system satisfaction, continued to use intention, system acceptance	Data was collected using survey from 88 students and focus group interview from 8 students. PLS was employed for analysis
Tselios et al. (2011) assessed the acceptance of BL course based on students' perception of BL in a university	Focused to measured university students' attitudes toward BL	TAM	Perceived usefulness, perceived ease of use, attitude toward use, and intention to use technology	Data was collected from 130 students before actual BL use and 102 students after BL used. PLS was utilized for data analysis
Ahmed (2010) examined students' perception towards hybrid e-learning acceptance	Studied learners' acceptance of hybrid e-learning based on factors that impacts learners' satisfaction	TAM	Organizational and technical support, instructor characteristics, IT infrastructure, students' acceptance and usage	Data was collected using survey from 538 usable responses from university students and Structural equation modeling (SEM) was employed for analysis
Ozkan and Koseler (2009) developed a blended e-learning assessment model to measure student learning	Aimed to evaluate LMS usage within universities as a supportive tool for BL environment	IS success model	System quality, service quality, content quality, learner perspective, instructor attitudes, and supportive issues	A survey instrument was utilized to collect data from 84 students and explanatory factor analysis was employed
Gong et al. (2004) proposed an improved technology acceptance model for online learning	Targeted to specify the main variables of IT acceptance in universities	TAM	Perceived usefulness, perceived ease of use, attitude, self-efficacy, intention to use, frequency of use	Survey data was collected from 146 samples and SEM was employed for data analysis

2018; Ismail et al., 2018; Teo, 2019) employed TAM and/or IS success model to investigate the relationship between variables that influence students acceptance of BL. Regardless of these observations, little is still known about how these variables contributes to the improving students' learning performance (Ghazal et al., 2018). As demands for BL approaches by institutions continue to expand, it is important to identify the influential determinants related to students' perceptions of BL integration and BL acceptance. This is because the outcome of BL integration relies on its sustained usage and satisfaction of students. Thus, it is important to investigate the relevant determinants vital for promoting learning (Ghazal et al., 2018). Therefore, empirical evidence is required to clearly show how certain variables can contribute to improve students' acceptance of BL. Hence, this study fills the gap in knowledge by developing a model grounded by TAM and IS success model similar to prior studies (Al-Busaidi, 2012; Ghazal et al., 2018) to develop a model to examine the determinants that influence students' perception towards BL acceptance and BL integration as a mode of study to improve learning performance.

2.3.1 Evolution and Impact of BL in Malaysia Institutions of Higher Education

Over the years institutions of higher education in Malaysia have improved based on the Malaysian Education Blueprint for Higher Education (MEBHE) (2015–2025) which aims for Malaysia institutions to cultivate innovative and creative use of ICT for improving technological advancement strategy which aims for the country to fully infuse ICT to improve teaching and learning in all universities, colleges, and polytechnics by 2025. Thus, BL is integrated based on the MEBHE (2015–2025) which overall mission for Malaysia universities, colleges, and polytechnics is to cultivate innovative and creative use of ICT for improving teaching and learning environment, improving skills and knowledge of pedagogical curriculum for the deployment of ICT in teaching and learning, implementing and extending digital education resources and, lastly promoting collaborative partnerships among educational expert groups (Brahim & Mohamad, 2018). This study was envisioned to provide a clearer guide on how institutions of higher education in Malaysia and beyond can achieve system quality, information quality, service quality in their current BL environment. Thus, the target of MEBHE termed globalized online learning aims to leverage on technology mediated learning as a medium to improve the access and quality of education (Ghazali & Nordin, 2018).

3 Model and Hypotheses Development

In this section, the derived variables and associated hypotheses are presented to achieve the objective stated in the introduction section of this paper.

3.1 Enhancement of BL Approach Integrated by Students

This sub-section aims to identify how BL approach integrated by students can be enhanced based on BL quality, information quality, and service quality derived from IS success model.

3.1.1 BL Quality

BL quality refers to characteristics, technical success, accuracy, and efficiency of BL in facilitating F2F and online learning (Mohammadi, 2015). BL quality measures the adaptability, usability, reliability, response time, and availability of both F2F and online learning integrated to support learning (Jnr et al., 2020; Urbach & Müller, 2012). Findings from prior works (Ghazal et al., 2018) revealed that BL quality positively influence the acceptance of e-learning systems and F2F teaching provided by the lecturer. Respectively, Ghazal et al. (2018) mention that if students perceive that BL approach provides F2F and online learning activities that are useful, these may influence their acceptance. Moreover, Lin and Wang (2012) state that the quality of BL entails its approach ability to provide students' access to both F2F and online educational resources.

3.1.2 Information Quality

Information quality refers to the quality of course content resources and information delivered through BL approaches to improve learning. The information quality of any BL approach should be accessibility, completeness, accuracy, understandability, sufficient to students. Thus, information quality is essential for learners in order to access accurate and precise curriculum resources regarding taught blended courses (Jnr & Noel, 2021; Tahar et al., 2013). Findings from Ghazal et al. (2018) confirm that information quality significantly influences the actual use of e-learning system and learning satisfaction. Likewise, Mohammadi (2015) confirm the role of information quality in assessing the suitability of BL environments, which influence the acceptance of BL by students. Moreover, Ghazal et al. (2018) states that if BL offers learners with well-designed F2F courses and suitable online contents then BL will be considered as easy and simple to students.

3.1.3 Service Quality

Service quality entails the quality of educational and services support provided to students who integrate BL approaches for learning (Jnr, 2021; Lin & Wang, 2012), based on the availability and reliability of offline and online technical support (Tahar et al., 2013). It is simply the support that students receive from IT support staffs on how to use BL approaches (Hassanzadeh et al., 2012; Urbach & Müller, 2012). Further results from Hassanzadeh et al. (2012); Mohammadi (2015); Ghazal et al. (2018) report that the technical support and guidance provided influence learners' acceptance of BL.

Based on these observations the following hypothesis is proposed;

H1 System quality, information quality, and service quality will positively influence perceived usefulness of BL.

H2 System quality, information quality, and service quality will positively influence perceived ease of use of BL.

3.1.4 Determinants that Influence Student Perception towards BL Acceptance

This sub-section aims to investigate the determinants that influence student perception towards BL acceptance. The derived determinants from TAM theory includes perceived usefulness of BL, perceived ease of use of BL, intention to use BL, attitude towards use of BL, and actual BL use.

3.1.5 Perceived Usefulness of BL

Perceived usefulness refers to the students' perception that BL approach will be useful in improving learning (Ghazal et al., 2018). Moreover, prior BL research (Mohammadi, 2015; Padilla-Meléndez et al., 2013) confirm that perceived usefulness is a critical factor that predicts the use and acceptance of BL. Based on the aforementioned observations, the following hypotheses were constructed;

H3 Perceived usefulness of BL will positively influence students' attitude towards using BL.

H4 Perceived usefulness of BL will positively influence students' intention to use BL.

3.1.6 Perceived Ease of Use of BL

This variable entails the extent to which students trusts that using BL is easy to use or require less effort to use (Ghazal et al., 2018; Jr et al., 2021). Thus, learners would be more willing to accept BL if they observe that F2F and online learning can be easily integrated. Findings from Al-Busaidi (2012) suggest that perceived ease of use has a positive influence on student's acceptance to use BL. Therefore, this study proposes the following hypotheses:

H5 Perceived ease of use of BL will positively influence perceived usefulness of BL.

H6 Perceived ease of use of BL will positively influence students' attitude towards using BL.

H7 Perceived ease of use of BL will positively influence students' intention to use BL.

3.1.7 Attitude towards Use of BL

Attitude refers to students positive/negative appraising opinions about implementing a certain behavior (Anthony Jr, 2019; Teo, 2019). Thus, students' attitude towards using BL is an essential determinant that influences their acceptance to use BL (Ghazal et al., 2018; Yeou, 2016). Findings from Teo (2019) state that learners who have encouraging attitudes toward IT usage for learning are more willing to use BL approach. Thus, this study hypothesized the following:

H8 Students' attitude towards using BL will positively influence their intention to use BL.

3.1.8 Intention to Use BL

In this research intention is defined as the prospect that student will use BL (Mohammadi, 2015). Moreover, intention to use relates to the decision and interest of learners to utilize BL before they in fact utilize it and it's primarily projected to happen in the future (Hassanzadeh et al., 2012). Moreover, Teo (2019) argue that when students integrate BL because it's useful, it leads to a immediate impact on learners intention to use BL. Based on this, the following hypothesis is formed:

H9 Students' intention to use BL will positively influence their actual BL use.

3.1.9 Actual Use

Actual use refers to the degree of cognitive impulsiveness of student interactions with BL initiatives. This can be achieved by introducing students to how F2F and online learning can be integrated to improve learning (Padilla-Meléndez et al., 2013). Additionally, actual use is considered influenced by the intrinsic belief of the learner which is centered on prior experiences with BL environment (Teo, 2019). Thus, the following hypothesis is formed based on the proceeding discussions. Thus, the following hypothesis is formed;

H10 System quality, information quality, and service quality will positively influence actual BL use.

3.1.10 Student Learning Performance Improvement

Performance in learning is used to measure the effectiveness of students learning (Mohammadi, 2015). Thus, learning performance in a course indicates the extent to which the students have gained and applied the acquired knowledge to achieve the subject's learning outcomes as specified by the lecturer's final assessment or exam grade (Fisher et al., 2018; Tahar et al., 2013). Accordingly, findings from Mohammadi (2015) indicate that perceived ease of use, perceived usefulness, students' intentions, and actual use significantly influence the final grades of student. Thus, this study proposes the following hypotheses:

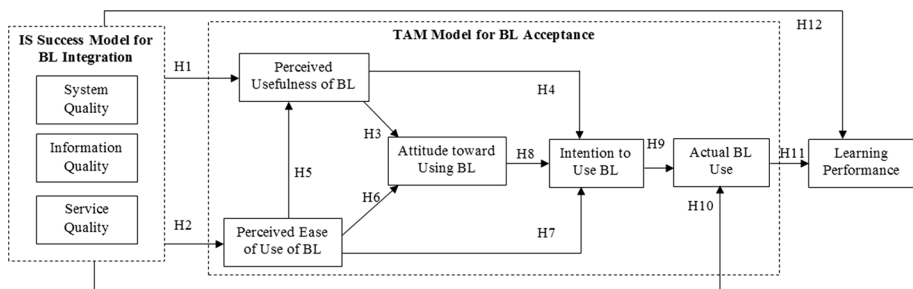


Fig. 2 Designed model

H11 Actual BL use will positively influence students' learning performance.

H12 System quality, information quality, and service quality will positively influence students' learning performance.

Based on the derived hypotheses grounded on TAM and IS success model a model is designed as depicted in Fig. 2. The designed model aims to explore the determinants that influence student perception towards BL acceptance and to identify how learning performance can be enhanced via BL integration.

Figure 2 presents the designed model which comprises of variables from TAM and IS success model which are employed to examine students' intention to use BL and their actual use of BL which eventually assess the academic performance of the students.

4 Research Methodology

This research adopts a quantitative research approach and data is gathered from Malaysia polytechnics, colleges, and universities that employ BL methodologies.

4.1 Study Context

The selected institutions integrate similar BL approaches in their educational procedure (hybrid face to face and digital based learning). The BL courses in the selected institutions ranges from 30% F2F to about 70% online learning in virtual classes. Moreover, each of the selected institutions currently integrates Learning Management Systems (LMS) such as Moodle as their official e-learning platforms. Therefore, the target sample for this research included students registered in blended courses. The students were selected due to their familiarity and experience with blended settings (both face to face and digital based learning). For ethical consideration the first section of the questionnaire specifies an introduction of the research study and permission was collected from the participants to voluntary participate in the study. In this study only the needed information was collected from the participants. Moreover, no personal data was collected from the respondents that can disclose the identity of the respondents and all data was securely stored offline.

4.2 Participants

The data were gathered through an online survey questionnaire as data collection instrument via "Lime survey platform". The questionnaire instrument was developed in English language by experts to improve the validity of the instrument to confirm the accuracy of the instrument (see Table 6 in appendix). Then the tool was deployed in real time and access to the questionnaire was mailed to respondents for pre-testing testing. Next, pre-test was implemented, and data was gathered from 59 learners to assess if the students understand the questions and test the reliability and validity of questionnaires instruments. Findings from the pre-test showed that the Cronbach's alpha value is greater than 0.7. Later, requests to take part in the main survey, as well as access to the online questionnaire, was delivered to learners from January-March 2019. The data collection entails a cross-sectional survey of randomly selected students across higher education in Malaysia as seen in Table 2.

Table 2 Higher institutions that participation in the questionnaire

Institution's category	Respondents
Public Universities	241
Private Universities	218
Institute of Teachers Education	238
Public College/Institutes	239
Private College/ University Colleges	30
Polytechnics	845
Total	1811

Bold signifies that the values are assessed if higher or lower than 0.500. If higher than 0.500 then its significant else its not significant

4.3 Research Procedure

The main sample for this research consists of students registered in blended courses. The questionnaire included demographic question measured using ordinal measurement (see Table 6 in appendix).

4.4 Data Collection

The questionnaire instrument measures how BL is currently integrated by the students in their institutions based on a Likert scale (see Table 7 in appendix). Lastly, the questionnaire measures the opinion of the learners in regard to BL deployment similarly based on a Likert scale. The instrument was designed grounded on current and validated instruments from previous studies (that employed TAM and information systems success model in BL) to measure both F2F and online learning. After data was gathered 1,811 respondents were collected, but 642 samples were eliminated due to missing options amounting to a total of 1,169 usable samples. The samples related to how BL is currently integrated by the students in their institutions and assessment of the perception of the students regarding BL acceptance were not completely provided by the respondents and thus were removed to avoid bias as these items were important and these responses were included may impact the validity and reliability of the findings.

4.5 Data Analysis

The survey data was evaluated using structural equation model-partial least square method which is a variance-based method that aids the analysis of path of latent variables in a model. Structural equation model-partial least square was employed as it is regard as a comprehensive statistical method that is suitable for compound models that consist of relationships among variables. Structural equation model-partial least square employs two primary analyses, the first is the assessment of the measurement model assessed by checking the convergent validity, reliability, and discriminant validity. Next, it involves the analysis of the hypotheses of the structural model. SmartPLS software

and Statistical Package of Social Science (SPSS) was employed as the research tools that was used to code and analyze the collected data.

5 Results and Discussion

5.1 Assessment of Measurement Model (Reliability and Validity)

Validity assesses the extent to which determinants in a model varies from other determinates in the identical model (Yeou, 2016). Reliability measures the degree to which the determinants give same results that are reliable and free from error (Yeou, 2016). Convergent validity evaluates whether items can effectively reflect their analogous determinant (Mohammadi, 2015). Convergent validity entails the assessment of construct validity and reliability. The reliability of the model determinants was evaluated by considering the internal uniformity measured by assessing the Average Variance Extracted (AVE) which indicates to the amount of variance a construct describes from its elements.

The AVE must be higher than or equivalent to the score of 0.5 as suggested by Hair et al. (2016); Anthony et al. (2020). The reliability is measured based on the Construct Reliability (CR) and Cronbach's alpha value which must be higher than 0.70 (Anthony Jr et al., 2018). The factor loadings value of each indicator is also taken into consideration, which offer support to assess convergent validity of all indicators which is expected to be greater than the threshold score of 0.50 as recommended by Al-Busaidi (2012). Table 3 shows that the model determinants' reliability (greater than 0.7) and AVE (higher than 0.5) are above the recommended values for all variables. Besides, Table 3 also displays the standard deviations (SD) and mean of the determinants. The SD scores are near to 0 and lower than 3, suggesting that replies from the respondents are not distributed. Results from Table 3 shows the mean score based on the 5-point Likert Scale (1 to 5), response from the respondents. For mean value 1 = least important, 2 = fairly important, 3 = important, 4 = very important, and 5 = most important. Where the mean value for the Likert scale collected from the students suggest that the mean scores are higher than 2.5 as advised by Anthony Jnr (2019) which is reflected as a significant criterion to determine student acceptance of BL (Anthony Jr et al., 2018).

5.2 Discriminant Validity

The discriminant validity assesses if two constructs statistically vary from each other (Mohammadi, 2015). Thus, Fornell and Larcker (1981) suggest the deployment of AVE to assess discriminant validity. To assess the discriminant validity of all determinants, Fornell and Larcker (1981) propose that the square root of AVE of each variable should be higher than the correlations shared between the variables and other variables in the model. Moreover, the value should be higher than 0.5 as suggested by Hair et al. (2016). When the average variance extracted score is higher than 0.5, it is suggested that the determinant comprises a minimum of 50% of the measured variation (Anthony Jr, 2019).

In Table 4 this study presents the discriminant validity for all determinants are specified in the designed model (see Fig. 2), to help assess if there is any Inter-determinants correlation among these determinants and if any to what extent as previously employed in prior BL studies (Al-Busaidi & Al-Shihi, 2012; Anthony et al., 2021; Dakduk et al., 2018).

Table 3 Validity, reliability, and descriptive statistics

Determinants	Code	Factor loadings	Cronbach's alpha (α)	Composite reliability (CR)	Average variance extracted (AVE)	Mean	Standard deviation
BL quality	SYQ1	0.673	0.874	0.902	0.570	3.98	0.533
	SYQ2	0.749					
	SYQ3	0.759					
	SYQ4	0.739					
	SYQ5	0.801					
	SYQ6	0.809					
	SYQ7	0.746					
Information quality	INQ1	0.783	0.886	0.911	0.594	4.06	0.513
	INQ2	0.766					
	INQ3	0.791					
	INQ4	0.730					
	INQ5	0.808					
	INQ6	0.775					
	INQ7	0.741					
Service quality	SEQ1	0.532	0.909	0.926	0.585	3.98	0.533
	SEQ2	0.798					
	SEQ3	0.813					
	SEQ4	0.741					
	SEQ5	0.802					
	SEQ6	0.763					
	SEQ7	0.795					
	SEQ8	0.798					
	SEQ9	0.800					

Table 3 (continued)

Determinants	Code	Factor loadings	Cronbach's alpha (α)	Composite reliability (CR)	Average variance extracted (AVE)	Mean	Standard deviation
Perceived usefulness of BL	PUS1	0.743	0.700	0.833	0.625	4.10	0.558
	PUS2	0.804					
	PUS3	0.823					
Perceived usefulness of BL	PEU1	0.801	0.790	0.864	0.615	4.01	0.571
	PEU2	0.815					
	PEU3	0.806					
	PEU4	0.708					
Attitude towards BL use	ATU1	0.761	0.858	0.898	0.638	4.01	0.563
	ATU2	0.835					
	ATU3	0.851					
	ATU4	0.782					
	ATU5	0.762					
Behavior intention to use BL	BIU1	0.755	0.776	0.856	0.599	4.01	0.571
	BIU2	0.747					
	BIU3	0.816					
	BIU4	0.775					
Actual BL system use	ASU1	0.617	0.867	0.898	0.560	3.79	0.616
	ASU2	0.782					
	ASU3	0.818					
	ASU4	0.794					
	ASU5	0.788					
	ASU6	0.681					
	ASU7	0.736					

Table 3 (continued)

Determinants	Code	Factor loadings	Cronbach's alpha (α)	Composite reliability (CR)	Average variance extracted (AVE)	Mean	Standard deviation
Learning performance	LEP1	0.692	0.930	0.941	0.614	3.92	0.581
	LEP2	0.796					
	LEP3	0.827					
	LEP4	0.796					
	LEP5	0.769					
	LEP6	0.782					
	LEP7	0.761					
	LEP8	0.806					
	LEP9	0.803					
	LEP10	0.797					

Table 4 Inter-determinants correlation

#	Determinants	1	2	3	4	5	6	7	8	9
1	Actual BL use	0.748								
2	Attitude towards BL use	0.698	0.799							
3	Behavior intention to use BL	0.650	0.719	0.774						
4	Information quality	0.667	0.749	0.692	0.771					
5	Learning performance	0.731	0.749	0.702	0.770	0.784				
6	Perceived ease of use of BL	0.639	0.750	0.702	0.704	0.700	0.784			
7	Perceived usefulness of BL	0.535	0.684	0.697	0.651	0.587	0.730	0.791		
8	Service quality	0.730	0.688	0.659	0.696	0.741	0.672	0.566	0.765	
9	BL quality	0.696	0.748	0.707	0.686	0.739	0.707	0.652	0.739	0.755

Bold signifies that the values are assessed if higher or lower than 0.500. If higher than 0.500 then its significant else its not significant

Thus, the results presented in Table 4 suggest that the model variables fulfill that imperative, as the square root value of the average variance extracted on the sloping is greater than the associations with other determinants and each score is greater than 0.5. Thus, all variables have a reasonable discriminant validity score greater than 0.5.

5.3 Assessment of Structural Model (Hypotheses Testing)

This subdivision assesses the relationships in the model in confirming the hypotheses of the model as shown in Fig. 2. The research model assessment is evaluated by checking the path coefficients (β) score which estimates the correlation among variables grounded on their degree of significance (p -value) which is substantial if $p = < 0.050$ when quantified using partial least squares path modeling to measures the weights of the determinants. Moreover, the measurement of determination referred to R^2 score is employed to determine the predictive significance of the research model. Then, the path coefficients (t -value) are utilized to evaluate the impacts of the model hypotheses, which is linked to the associated significances and regression coefficients as shown in Table 5. A bootstrapping procedure of 5000 samples was applied to check the significance level of the model relationship paths (t -value). Also, t -value should be higher than 1.96 as mentioned by Hair et al. (2016).

Results from Fig. 3 and Table 5 depict the significance testing of the model hypotheses presented in Fig. 2. H1 states that BL integration will positively influence perceived usefulness of BL. Results from Table 5 show that H1 path coefficient is 0.262 ($t=7.009$, $\beta=0.655$, $p=0.000$), therefore supporting H1 since t -value is greater than 1.96 benchmark and path coefficient is higher than 0 (Anthony Jr, 2019). Similarly, H2 states that BL integration will positively influence perceived ease of use of BL. Results from Table 5 further suggest that H2 path coefficient is 0.732 ($t=34.118$, $\beta=0.730$, $p=0.000$), therefore supporting H2. Next, H3 states that perceived usefulness will positively influence students' attitude towards using BL. Accordingly, results from Table 5 disclose that the hypothesis is significant where path coefficient is 0.292 ($t=7.591$, $\beta=0.678$, $p=0.000$). Similarly, results from Table 5 reveal that perceived usefulness positively influence students' intention to use BL (H4) with path coefficient of 0.221 ($t=7.126$, $\beta=0.688$, $p=0.000$). Likewise, the results confirm H5 which suggest that perceived ease of use positively influence perceived usefulness of BL with path coefficient of 0.538 ($t=15.479$, $\beta=0.723$, $p=0.000$).

Table 5 Summary of the structural model

Hypotheses	Path description	Path coefficient	Standard error (SE)	Beta (β)	R ²	t-value	Significance level (p-value)	Results
H1	BL Integration—> Perceived Usefulness of BL	0.262	0.025	0.655	0.429	7.009	0.000	Supported
H2	BL Integration—> Perceived Ease of Use of BL	0.732	0.023	0.730	0.534	34.118	0.000	Supported
H3	Perceived Usefulness of BL—> Attitude Towards Use	0.292	0.022	0.678	0.460	7.591	0.000	Supported
H4	Perceived Usefulness of BL—> Behavior Intention to Use	0.221	0.022	0.688	0.473	7.126	0.000	Supported
H5	Perceived Ease of Use of BL—> Perceived Usefulness of BL	0.538	0.020	0.723	0.522	15.479	0.000	Supported
H6	Perceived Ease of Use of BL—> Attitude Towards Use of BL	0.537	0.019	0.749	0.560	15.299	0.000	Supported
H7	Perceived Ease of Use of BL—> Behavior Intention to Use BL	0.092	0.021	0.692	0.479	2.446	0.015	Supported
H8	Attitude Towards Use of BL—> Behavior Intention to Use BL	0.600	0.017	0.812	0.659	19.269	0.000	Supported
H9	Behavior Intention to Use BL—> Actual BL System Use	0.242	0.024	0.637	0.405	6.961	0.000	Supported
H10	BL Integration—> Actual BL System Use	0.566	0.025	0.720	0.518	15.747	0.000	Supported
H11	Actual BL System Use—> Learning Performance	0.199	0.022	0.718	0.515	6.381	0.000	Supported
H12	BL Integration—> Learning Performance	0.717	0.017	0.861	0.742	26.56	0.000	Supported

Decision: Hypothesis is supported if *t-value* = > 1.96 and *p-value* = <0.050

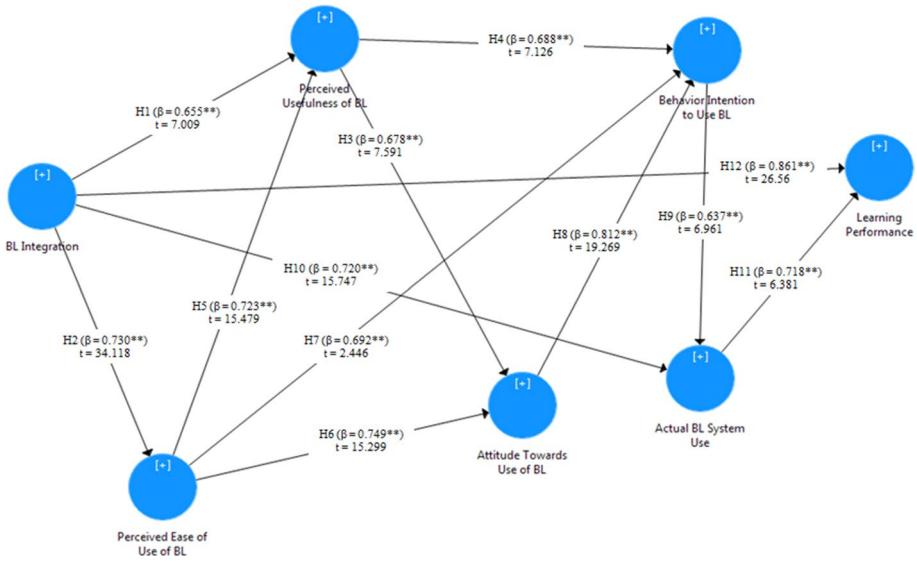


Fig. 3 Results of the model testing. Note: ** means significant when $p < 0.050$

Furthermore, results reveal that H6 which posit that perceived ease of use positively influence students’ attitude towards using BL is statistically significant with path coefficient of 0.537 ($t = 15.299$, $\beta = 0.749$, $p = 0.000$).

Results from Table 5 further confirms H7 that perceived ease of use positively influence students’ intention to use BL with a path coefficient of 0.092 ($t = 2.446$, $\beta = 0.692$, $p = 0.015$). Next, the results support H8, students’ attitude towards using BL will positively influence their intention to use BL with path coefficient of 0.600 ($t = 19.269$, $\beta = 0.812$, $p = 0.000$). Moreover, results provide ample support for H9 confirming that students’ intention to use BL is positively influenced by their actual BL use with path coefficient of 0.242 ($t = 6.961$, $\beta = 0.637$, $p = 0.000$). The results suggest that BL integration positively influence actual BL use (H10) with path coefficient 0.566 ($t = 15.747$, $\beta = 0.720$, $p = 0.000$), hence H10 is supported. Next, for (H11) actual BL use significantly influence students’ learning performance path coefficient is given as 0.199 ($t = 6.381$, $\beta = 0.718$, $p = 0.000$) therefore H11 is supported. Finally, for (H12) BL integration positively influence students’ learning performance is also confirmed from the results with path coefficient of 0.717 ($t = 26.56$, $\beta = 0.861$, $p = 0.000$), thus H12 was also supported. Interestingly, the results suggest that (H2) “BL Integration—> Perceived Ease of Use of BL” with t -value = 34.118 is the most significant relation suggesting that the easiness of BL approaches is the most important variable that influences students to use integrate BL for academic purposes.

In addition, the literature (Baragash & Al-Sammarraie, 2018), recommended that R^2 values of 0.67, 0.33, and 0.19 were regarded as excellent, average, and low, respectively. Likewise, Salloum et al. (2019) suggested that the R^2 value should be greater than 0.10 to be acceptable. Thus, results from Table 5 show that the R^2 values range from H1=0.429, H2=0.534, H3=0.460, H4=0.473, H5=0.522, H6=0.560, H7=0.479, H8=0.659, H9=0.405, H10=0.518, H11=0.515, H12=0.742. The

result suggests that all R^2 values are higher than 0.1 as recommended by Salloum et al. (2019) and ranges from 0.405 for H9 and 0.742 for H12 indicating that an average to excellent R^2 values (Baragash & Al-Samarraie, 2018). The results empirically confirm that H12 has the strongest effect, thus BL integration impact fully improves students' learning performance and H9 has the least strong effect highlighting that students' intention to use BL for academic purpose effects the actual usage of BL for educational activities.

5.4 Discussion

This study examines students' perception on BL integration and acceptance towards improving learning performance in institutions of higher education. A research model was developed grounded by TAM and IS success model. Data was collected using survey instrument from students in Malaysia universities and colleges to empirically test the model and PLS-SEM was employed to analyze the survey data. The results from this study show a significant relationship between BL integration (system quality, information quality, and service quality) and perceived usefulness of BL. This result is in line with findings from prior studies (Al-Busaidi, 2012; Ozkan & Koseler, 2009). One possible explanation is that system quality is based on the student's perception in regard to the flexibility, ease of use, interactivity, responsiveness, user-friendliness, and stability of BL approaches which determines the perceived useful of BL (Ghazal et al., 2018; Lin & Wang, 2012). Likewise, the results suggest that the quality of information provided by BL approaches enhances learning which also influence how students perceive the usefulness of BL approaches (Hassanzadeh et al., 2012). Similarly, the result is also analogous with findings from Mohammadi (2015) who revealed that the availability of miscellaneous support that assists learner in a timely manner to address problems originating from the use of BL approaches do influence students perceived usefulness of BL.

Moreover, the study confirms that BL integration (system quality, information quality, and service quality) positively influence perceived ease of use. This result is in parallel with findings from prior studies (Ghazal et al., 2017; Ozkan & Koseler, 2009) where the authors suggested that system quality positively determines system use and students' satisfaction of BL approach. Likewise, Al-Busaidi (2012) stated that information quality plays a substantial role in the use of BL in relation to the perceived usefulness, perceived ease of use, and student intention to use BL. Additionally, the result is similar to findings from Ghazal et al. (2018) where the researchers confirmed that quality of service improves the acceptance of students to use e-learning in relation to their perceived ease of use and perceived usefulness. Also, results indicate that perceived usefulness of BL has a direct effect on students' attitude towards using BL. This result is similar to findings from Teo (2019) where the author established that the perceived usefulness has a positive influence on student attitude and intention towards use of BL initiatives. As a consequence, the greater the perceived usefulness of BL approaches, the more significant is the students' attitude and intention towards usage, hence greater the prospect that BL will be used (Mohammadi, 2015).

One of the interesting findings of the study is that the perceived usefulness of BL has a positive effect on students' intention to use BL. A possible interpretation is that the perceived usefulness measures the degree to which students believe that their educational activities will be enhanced by integrating BL (Isa et al., 2015). Correspondingly, findings from previous studies (Davis, 1989; Teo, 2019) suggested that the perceived

usefulness significantly determines the extent to which a student believes that using BL approaches would improve their academic efficiency. The results support the conclusion made by Al-Busaidi (2012); Yeou (2016); Ghazal et al. (2018) that perceived ease of use significantly influence perceived usefulness of BL. This result seems quite reasonable since perceived ease of use of BL relates to the degree to which the students expect that BL use will comprises of less effort or free of difficulty in learning (Ismail et al., 2018). Also, in accordance with Tselios et al. (2011); Mohammadi (2015); Teo (2019) the results suggest that the perceived ease of use has a direct effect on student attitude towards use of BL in improving educational activities. This result is also in line with findings from Ghazal et al. (2017), where the authors found that BL approaches supports the students to apprehend the easiness of BL and feels relaxed to learn via online or F2F mode.

In addition, the results indicate that the perceived ease of use has a positive effect on student intention to use BL. This result is similar to findings from prior studies (Ghazal et al., 2018; Ismail et al., 2018) which confirmed that the perceived ease of use impacts both perceived usefulness, intention to use, and attitude of students towards using BL. Another interesting observation relates to the effect of attitude towards students' intention to use BL, where the results confirm this hypothesis. One possible explanation is that the attitude is based on the student's experiences which may be negative or positive feelings encountered in using BL approaches. This result is similar to findings from prior studies (Ismail et al., 2018; Teo, 2019), where the results from the researchers suggested that the students' attitude is an important factor that influences of BL usage as it entails not only the value, understanding, and knowledge of technology, but also learners' ability to integrated BL initiatives. Hence, students who exhibit a positive attitude toward the use of BL are more likely to perceive its value and subsequently use BL for educational purposes, thus influencing BL acceptance (Ghazal et al., 2018). In this study, intention to use BL is found to be a significant variable that influences actual use of BL by students. This result is consistent with the studies undertaken by Mohammadi (2015); Al-Rahmi et al. (2018) where the authors highlighted that intention to use embodies the extent and manner in which BL is utilized by students.

Furthermore, the results suggest that the student's intention to use BL is significantly influenced by perceived usefulness and perceived ease of use of BL. This result is also analogous with findings from Teo (2019) which suggested that students are more likely to continue using BL if their level of learning with BL and the perceived usefulness of BL are high. Similarly, students' intention to use BL to a large extent is influenced by their current use satisfaction (Hassanzadeh et al., 2012). Likewise, this result is parallel to prior study (Al-Busaidi, 2012) which revealed that student's continuous intention to use BL is significantly determines by its actual use. The results showed significant relationships between BL integration (system quality, information quality, and service quality) and actual BL use. This result is similar to findings from prior studies (Padilla-Meléndez et al., 2013; Teo, 2019), which confirmed that the system quality which assesses the technical success of BL approaches should improve and facilitate learning. Also, the information quality which provides quality resources delivered through BL approach to students should also be accessible in different format and lastly service quality which requires provision of quality end users supports to students who use BL for educational purposes. Thus, the result confirms what Hassanzadeh et al. (2012) concluded in their study suggesting that the current BL approach integrated by institutions will influence student perception towards actually using BL for educational purpose.

Another notable observation is the relation between actual use and learning performance, where the results confirm this hypothesis suggesting that actual use of BL significantly influences learning performance of students. A possible interpretation is that actual use of BL is based on how interactive and intrinsically interesting BL activities are to the student who derives pleasure and enjoyment in learning (Teo, 2019). Furthermore, actual use of BL could be reflected as a part of the facilitating factor that determines the learning performance (Padilla-Meléndez et al., 2013). Lastly, based on BL integration impact on learning performance, it is evident that system quality, information quality, and service quality are components that positively determine students learning performance in BL environment. Thus, the results confirm the hypothesis that BL integration influence learning performance.

This result is analogous with findings from previous studies (Fisher et al., 2018; Tahar et al., 2013) which revealed that BL practice integrated in universities has a direct effect on user satisfaction can also affect the success of students in improving their grades and learning performance. Thus, the quality of information, services and systems related to blended syllabus course content output presented to student and learning resources provided to students are key determinants that influences students learning performance (Lin & Wang, 2012). Accordingly, results from this study indicates that BL approaches integrated in universities and colleges should offer individual, tangible, timely, reliable, responsive, and professionally customized services, which may influence the quality of information system service and impact on students' perceptions and acceptance of BL usefulness.

6 Implications of Study

6.1 Theoretical Implications

With the increased emphasizes on institutions of higher education to improve the quality of teaching and learning, BL is integrated to provide universities and colleges with the medium to store, share, and manage educational resources and knowledge. BL integration provides proficient medium to teach and train students. The success of BL integration in universities and colleges is initiated by management in the institutions, but its survival and success in future depends on the students' acceptance and use. This study employed TAM and IS success model to develop a model that identifies how BL approach integrated by students can be enhanced and further investigate the determinants that influence student perception towards BL acceptance. Moreover, this study explores on how student learning performance can be improved in BL environment. Theoretically, this study employed TAM to provide insightful information regarding students' behavioral patterns towards BL acceptance in universities, colleges, and polytechnics towards improving student learning performance.

Accordingly, this study offers substantial findings for BL academicians, educationalist, and practitioners, by comprehensively examining the critical determinants that influences students' acceptance of BL. Finding from this study provides a road map for institutions to foster BL approaches to improve student acceptance and satisfaction of F2F and online learning. Overall, the findings statistically establish that BL integration contributes to improve student perceptions, attitude, and intention to use BL to improved academic performance. Given the implicit relationship between BL integration, acceptance, and learning performance these significant results and can be utilized by decision-makers

and educational agencies to improve BL pedagogies. The derived associated items for perceived usefulness, perceived ease of use, attitude towards use, behavior intention to use, actual system use, and learning performance as seen in the questionnaire items provides benchmark indicators to be employed by Malaysia institutions of higher education and in other countries to assess the current BL acceptance of students in universities and colleges.

The model developed in this study is also vital to be employed in institutions of higher education as a reference tool for integrating BL initiatives in Malaysia and also has the potential implications for achieving self-directed students to suit the lifelong learning. Further implications from this study suggest that perceived usefulness and perceived ease of use have significant direct impact on students' attitude to use BL. Moreover, student's attitude towards BL, intention to use BL, and actual BL use were significant in determining students' perceptions of accepting BL as a mode of study. Thus, university administration should initiate programs that increase the knowledge and awareness of learners as part of a strategy to promote the continued use of BL in order to move research and practice of deploying IT for education in universities and colleges.

6.2 Practical Implications

This study was envisioned to provide a clearer guide on how institutions of higher education in Malaysia and beyond can achieve system quality, information quality, service quality in their current BL environment as seen in the questionnaire items. Practically, this study adopted IS success model to provide understandings into the current state of BL integration to enhance students learning performance. In addition, institutions integrating BL should improve the quality of deployed system, quality of information, and support services provided. The results suggest that students play a key role on BL integration, thus students should show positive attitude toward BL. Moreover, institutional administration needs to ensure that students are trained well and have good awareness regarding their perception towards the ease and usefulness of BL, because if students consider BL to be difficult to use they may become unwilling to use it, consequently undermining the potential of IT integration to improve learning performance in universities, colleges, and polytechnics. Likewise, institutional administration should constantly improve the quality of BL and ensure its reliability, capability, richness, flexibility, interactivity, and speed towards improving learning activities.

Findings from the study also suggest that the success of BL integration positively influences students' intention to continuously use BL. Therefore, once students use BL and they perceive it to be useful and easy, and accept it, they will continue to use it. Hence, students' actual use of BL is an important component for its survival and attainment of improved learning conditions. Furthermore, in order to increase students' overall acceptance of BL, current approach should be improved to effect changes in the perceived usefulness of BL. Moreover, lecturers should show how BL would improve learning and improve students' knowledge. To do so, specific care should be carried out to provide user-friendly, up-to-date, and useful blended course content. Respectively, the results suggest that system quality, information quality, and service quality of BL approach integrated actually contribute to students' positive experience and acceptance of BL. Hence, it is required that the quality of blended services need to be deployed with interactive ICT applications, which may contribute to the improvement of the learning quality, thus resulting to students having a positive perception towards BL acceptance.

7 Conclusion

This study is an answer to the call from Fisher et al. (2018); Ghazal et al. (2018) for research that investigate how BL acceptance influences student performance. Respectively, this study develops a model based on TAM and IS success model to examine students' perceptions about accepting BL, and further analyzed the quality determinants (system quality, information quality, and service quality) affecting the perceived usefulness, perceived ease of use, and intention of students' to actually use BL to improve learning performance. Furthermore, to extend the understanding of students' acceptance behavioral, this study included attitude towards use as a mediator in the association between intention to use BL and actual BL use. Data was collected from students in Malaysia universities, colleges, and polytechnics and analyzed using PLS-SEM. Findings from this research differ from prior studies because unlike past BL studies which investigated the factors effect on intention to use, this study examines the influence of the determinants on actual use of BL through intention to use BL to enhance learning performance. Thus, this current study provides implication that offers invaluable information on students' perception towards BL acceptance.

Moreover, findings from this study indicates that system quality, information quality, and service quality have a positive impact on actual BL use and learning performance of students Hence, it is recommended for university administration to provide BL approaches to students which are visually adequate, flexible, secure, user-friendly, interactively designed, reliable, and attractive with fast support response time. This study contributes to the body of knowledge by providing empirical evidence regarding the acceptance of BL based on survey data from students enrolled in Malaysia universities, colleges, and polytechnics. But, like any other empirical study this study is not without limitations. First, the samples were collected from institutions of higher education in Malaysia, thus more research can be conducted in different countries to provide more significant insights into students' acceptance of BL and also increase the generalization of the findings. Secondly, the study examines BL acceptance and integration from the student's perspective. Further research is needed to investigate BL from lecturers and university administration perspective.

Furthermore, the mandatory nature of BL use in universities and colleges may influence learners' perception. Besides, the respondents were mainly from polytechnics. This may impact the findings as learners' attitudes may differ if more university students were involved in the sample. Additionally, cross-sectional data is collected in this study across institutions of higher education in Malaysia to assess students' perceptions and acceptance of BL within a particular session. Further studies are required to employ longitudinal survey because students' preferences and perceptions are expected to change as they attain more experience in regard to BL integration over time. Further research may include examining moderating variables, such as gender, age, and educational status influence of students' acceptance of BL integration.

Appendix

See Tables 6 and 7.

Table 6 Demographic information of students

Profile	Options	Percentage (%)
Gender	Male	38.6
	Female	61.4
Age	Above 1980	0.5
	1981–1990	1.3
	1991–2000	95.9
	2001 below	2.3
Current phase of study	First Year	33.8
	Second Year	36.5
	Third Year	19.3
	Fourth Year	7.6
	Fifth Year and Higher	2.8
Registered phase	Doctorate	1.7
	Master's Degree	1.5
	Bachelor's Degree	49.9
	Advance Diploma	27.9
	Others	19.1
Establishment type	Public	86.7
	Private	13.3
Study mode	Full-Time	98.5
	Part-Time	1.5
Study area	Education	10.9
	Accounting/Management/ Finance/Business	13.4
	Sciences	1.5
	Technology	0.3
	Engineering	21.9
	Computer science	11.2
	Social science	1.9
	Health & Medicine	0.9
	Arts & Humanities	3.6
	Agriculture	1.9
	Mathematics & Statistics	1.2
	Architecture & Building	1.6
	General Studies	4.6
Law	0.3	
Others	24.7	

Table 7 Questionnaire items

Variables	Items	Sources
System quality	SYQ1-My lecturer organizes physical and online class	(Barnard et al., 2009; Padilla-Meléndez et al., 2013)
	SYQ2-I can monitor my learning progress in online learning	
	SYQ3-I can access course information/instruction throughout semester via F2F and online	
	SYQ4-My academic objectives and requirements are met by F2F and online learning	
	SYQ5-The materials in F2F course enable me to learn actively	
	SYQ6-The materials in online course facilitate me to understand the course	
	SYQ7-The F2F and online instructional materials are helpful in developing my skills	
Information quality	INQ1-I am satisfied with course information provided through F2F and online	(Arbaugh et al., 2008; Liaw, 2008; Lin & Wang, 2012)
	INQ2-I believe F2F course information provided is informative	
	INQ3-The course information is available at a suitable time	
	INQ4-The course information provided is important and helpful for my work	
	INQ5-I utilize F2F and online data sources to explore tasks presented in this course	
	INQ6-Usage of multimedia has increased my online learning experiences	
	INQ7-Teaching materials are downloadable	

Table 7 (continued)

Variables	Items	Sources
Service quality	<p>SEQ1-F2F and online assessment reviews assist me to prepare for future assessment</p> <p>SEQ2-I am satisfied with the F2F assessment procedures in the course</p> <p>SEQ3-It is easier to complete the assessments using F2F and online</p> <p>SEQ4-F2F assessments help in improving my knowledge</p> <p>SEQ5-I received feedback from peers during F2F learning interaction</p> <p>SEQ6-I received feedback from lecturers during F2F learning interaction</p> <p>SEQ7-I learnt from online learning interaction</p> <p>SEQ8-I am pleased with the F2F guidance that I obtained from the lecturer</p> <p>SEQ9-The online learning offer feedback at anytime and anywhere</p>	(Arbaugh et al., 2008; Ozkan & Koseler, 2009; Sun and Qiu, 2017)
Perceived usefulness of BL	<p>PUS1-I have basic resources and ICT skills to use online learning</p> <p>PUS2- F2F and online learning helps me to reduce my expenditure</p> <p>PUS3-Through online learning, my learning time become more flexible</p>	(Machado, 2007; Liaw, 2008)
Perceived ease of use of BL	<p>PEU1-I am satisfied with the F2F and online engagement time throughout the course</p> <p>PEU2-My motivation to learn increased because of F2F and online courses</p> <p>PEU3- F2F material motivates me to learn</p> <p>PEU4-Online courses allow learning to occur anytime, anywhere and anyhow</p>	(Barnard et al., 2009; Padilla-Meléndez et al., 2013)

Table 7 (continued)

Variables	Items	Sources
Attitude towards BL use	ATU1-The learner-content and learner-instructor interaction is useful ATU2- F2F is useful for enhancing learning ATU3-I would recommend online learning to other students ATU4-I feel confident using online contents ATU5-I am able to complete the tasks using F2F learning	(Barnard et al., 2009; Padilla-Meléndez et al., 2013)
Behavior intention to use BL	BIU1-I am able to use F2F to complete the given task by my lecturer BIU2-Online learning saves me time from travelling to class BIU3-By using F2F and online, I can plan my study BIU4- By using F2F and online, I can shorten the time of my study preparation	(Lin & Wang, 2012; Poon, 2014)
Actual BL system use	ASU1-Online learning allows me to access the course content anytime ASU2-I receive online feedback regarding a course from my lecturer ASU3-The lecturer's F2F response has motivated me to learn more ASU4-I received prompt F2F feedback from my lecturer ASU5-The lecturer aids e-discussions between students through provided platform ASU6-I would like opportunities for F2F communication with other classmates ASU7-I prefer F2F and online communication with the instructor	(Ginns and Ellis, 2007; Barnard et al., 2009)

Table 7 (continued)

Variables	Items	Sources
Learning performance	LEP1-Interaction with my peers through online learning satisfies my learning need	(Ginns and Ellis, 2007; Barnard et al., 2009)
	LEP2-Academic goals and needs are achieved using F2F learning	
	LEP3-F2F learning gives opportunity to review and improve my work	
	LEP4-My grade reflects the effort spent for F2F and online activities	
	LEP5-F2F materials make it simpler to learn course resources	
	LEP6-F2F learning improves my assignments scores	
	LEP7-Online learning improves my learning	
	LEP8-Online learning helps me to concentrate more on my studies	
	LEP9-F2F interaction with my lecturer optimizes my learning	
	LEP10-The lecturer's online responses motivated me to do more online learning	

Acknowledgements The author appreciates other project members who contributed during the discussion of the project.

Author contributions The author contributed to writing the entire manuscript.

Funding Open access funding provided by Ostfold University College. This research project is financially supported by the Fundamental Research Grant Scheme (FRGS) from Ministry of Education, Under Universiti Malaysia Pahang Malaysia Grant No RDU180702.

Data Availability Data will be made available on request.

Declarations

Conflict of interest The author declares that the study does not have any conflicts of interest.

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