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PAPER

Evaluating Mobile E-Learning Systems Acceptance: An Integrated Model

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ABSTRACT

Previous studies have confirmed that managers need to develop influencing strategies to encourage employees to accept mobile information systems. Despite the recognition in past research that external variables can influence employee's perceptions, the explanation of how their approval of the framework is affected by these external variables' pathways or procedures remains limited. Participants were selected from Malaysian institutions that have previously rolled out mobile e-learning technologies into their operations. Empirical findings disclose that source credibility is positively associated with playfulness, perceived ease of use, and perceived usefulness. Similarly, organizational support and task equivocality are significantly related to perceived ease of use and perceived usefulness. Additionally, perceived ease of use positively affects playfulness, perceived usefulness, and employee attitude. Finally, an employee's attitude is positively and significantly related to behavioral intentions (BI). The findings of this study provide insight for firms considering implementing a mobile information system at all levels of their institutions. Furthermore, it offers employees valuable information about the system, its value, benefits, and advantages.

KEYWORDS

information systems, distance learning acceptance, mobile e-learning systems, Technology Acceptance Model (TAM), structural equation modeling

1 INTRODUCTION

Information technology (IT) is integral to the execution of many different managerial, analytical, and systemic procedures within organizations [1, 2]. It provides a valuable new opportunity for workers to improve their expertise and abilities through advanced technology [3]. It is not uncommon for firms to invest millions of dollars in the introduction of new systems to accomplish long-term benefits [38]. It is essential to note that system adoption is not exclusively determined by technology or systems, but also by the willingness of employees to adopt such systems [4, 8, 76].

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This study makes several research contributions. The focus of this research is to use Technology Acceptance Model (TAM) as the baseline approach to determine how employees will use mobile e-learning systems within their organizations. Firstly, this study uses TAM to predict how employees use mobile e-learning systems within organizations. The hypothesized relationships between employees' perceptions and attitudes toward using mobile e-learning systems were examined and validated by SEM [7]. An essential addition to this study was the use of attitude as a dependent variable to predict the intention to use TAM. Moreover, this research expanded TAM by considering other variables related to the user, including source credibility rating (SCR), task-related factors, and organizational variables. The following are the contents of the study: The second part of this paper is a literature review that focuses on the theoretical underpinnings and hypothesis development. We detail the data collection processes and sample design used to formulate the study questions in Section 3. Section 4 of this paper examines the results of the empirical research, while Section 5 discusses the potential management implications, future research prospects for practitioners, and the paper's limitations.

2 RESEARCH MODEL AND HYPOTHESES FORMULATION

2.1 Technology acceptance model

The Technology Acceptance Model (TAM) is grounded in the theory of reasoned action [42]. According to the theory of reasoned action (TRA), behavior is a result of a person's beliefs about the outcome of behavior, and outcomes are assessed according to their value. The TAM philosophy is comparable to TRA, where individual beliefs influence attitudes towards using a system, resulting in the intent to exploit it. It is attitudes and actual usage intentions that derive from perceived usefulness (PU) and perceived ease of use (PEU). PU is the extent to which an employee anticipates technology to improve their output, while PEU is the extent to which they feel utilizing the technology would be convenient and straightforward [49]. This is one of the most popular models and is frequently used in studying technology acceptance, mainly due to its efficiency and flexibility of usage [14, 15, 16, 26]. The purpose of this study is to scrutinize employees' adoption behavior of mobile e-learning system changes using the TAM model as the theoretical and the proposed research model is represented in Figure 1.

2.2 Task equivocality, perceived ease of use, and perceived usefulness

Numerous researchers have studied the characteristics of tasks and how they affect the use of information systems [50, 51, 70, 72, 73]. However, the constructs of the TAM are not fully applicable to the different task environments in which users work. A lack of task focus has resulted in mixed results when evaluating IT and its acceptance, use, and performance [52, 53, 54, 63]. It is necessary to explicitly include task characteristics in TAM's usefulness concept to improve your insight into the use of IT [9, 13, 14, 15, 16, 29, 67, 71].

A study conducted by [17] found a positive connection between task characteristics and PEU and PU. In task characteristics, equivocality refers to how much uncertainty or confusion is present during the performance of the task [34]. According to [34], it appears that task equivalency (TE) has a positive impact on individuals'

PU of an e-learning system. Research has also suggested that TE and interconnected tasks influence a person's willingness to use online learning programs. Nevertheless, only TE significantly affected PU in these studies [53, 54, 63]. Moreover, this study contends that when employees are required to take on demanding, novel, or difficult duties, they perceive that a digital training platform is stable and somewhat user-friendly [44, 48]. Consequently, this study developed e-learning technology approaches related to task equivalency.

H1a: *Task equivalency has a positive effect on perceived ease of use*
H1b: *Task equivalency has a positive effect on perceived usefulness*

2.3 Source credibility, playfulness, perceived ease of use, and perceived usefulness

According to [61], SCR is a person's skill to convey an independent opinion about the subject matter of the advertisement. It has been shown that SCR influences decision-making by shifting or enhancing the way that messages are processed [75]. According to [80, 84], individuals who focus on external cues are more likely to exhibit strong emotional responses than those who elaborate on them. As employees rely on the credibility and trustworthiness of sources, they respond to external cues and evaluate messages accordingly Bhattacherjee and Sanford (2006) suggest that supplementary cues, such as the SC, may affect human behavior. When employees feel confident in the credibility of the source, they are more inclined to seek out information, arouse imaginations, and engage in independent awareness [6]. It is more enjoyable to acceptance of a system when responses from authentic sources are combined. Consequently, the following hypothesis is suggested:

H2a: *Source credibility has a positive effect on playfulness*

Individuals who receive information from credible sources have a positive perception of the system [59]. A source's credibility may have a positive impact on employee cognitive evaluations, such as their perceptions of PU and PEU. In the presence of associated remarks from experts, workers are more willing to evaluate the information seriously and come up with better ideas or proposals [75]. If businesses use trustworthy experts to highlight the simplicity and usefulness of new technology, workers may nevertheless replace their intellectual processes with the researcher's advice [27, 30]. Researchers found that consultants perceive the usefulness of an information system as more valuable when the SCR is high [77]. A firm that uses reliable expert recommendations to establish SCR motivates understanding among workers of the value of technology. Therefore, owing to the argument above, the following hypotheses are developed:

H2b: *Source credibility has a positive effect on perceived ease of use*
H2c: *Source credibility has a positive effect on perceived usefulness*

2.4 Organizational support, perceived ease of use, and perceived usefulness

As defined in the study, organizational support (OS) denotes the degree to which executives and middle managers allocate resources to support coworkers in achieving managerial objectives [9, 13, 16]. In previous literature, positive relationships

have been documented between OS and the use of computer systems [49]. Several studies have demonstrated that OS affects beliefs and behaviors about computer utilization [32, 58, 80]. Besides, the lack of an OS adversely affected the effectiveness of computer use [49]. Additionally, [32] articulates that the level of OS is related to both PU and PEU. Furthermore, top management support lends itself to promoting the usage of digital technology programs through the provision of necessary resources and upgrades to computer systems. The support of top management enhances attitudes that are favorable toward computers and changes perceptions about their PU and PEU [81]. In this regard, organizational and managerial support strengthens employees' trust in the organization, leading them to take risks in implementing digital technology [11, 18–21]. Based on the above discussion, this study formulates the following hypothesis:

H3a: *Organizational support has a positive effect on perceived ease of use*
H3b: *Organizwational support a positive effect on perceived usefulness*

2.5 Perceived ease of use, the playfulness of the e-learning system and perceived usefulness

It is important to recognize that individuals are not always logical or rational, and sentiment plays a significant role in their acceptance of new technologies [52]. As part of the technology acceptance research, three different approaches have been proposed: perceived enjoyment, flow, and perceived level of fit (PLF). In e-learning systems, PLF has been stated as "the degree of cognitive spontaneity in user interactions with the online system" [6, 10]. Furthermore, [37] contends that the PEU of the information system is directly related to PLF. As a consequence, employees feel more interested in and in control of information system implementation when they spend time working on it and experience its benefits.

H4: *Perceived ease of use has a positive effect on the playfulness of the e-learning system*

In addition, PEU and PU have been studied [49]. According to [83], PEU exerts a positive influence on the PU of online hotel systems. Several prior investigations have shown the relationship between PEU, PU, and attitude has been empirically validated across a variety of management settings [69]. As a result, they concluded that PU and PEU were the two most significant components for system usage. The PEU refers to the individual's attitudes toward how often brain effort is needed to perform a particular task [35, 36, 37]. There is a direct correlation between PEU and PU, which influences the user's original purpose for using online systems [62].

H5: *Perceived ease of use has a positive impact on perceived usefulness*

2.6 Perceived usefulness, perceived ease of use, playfulness, and attitude of e-learning system

According to [68], an individual's attitude toward an e-learning system can be determined by their perception of positive or negative emotions related to it. A person's attitude toward using the electronic learning platform, along with PU and PEU, will influence both how technology is actually used and how well it works [52]. It is believed that both PU and PEU significantly affect a user's attitude toward using

an online learning system. In the present study, PU and PEU are well related to AT across a range of information systems, which supports earlier findings [81, 85]. The empirical results from [54] also confirm that PEU directly affects attitude. The relationship between PEU, PU, and attitude has been empirically validated across a variety of organizational contexts, as established by [69]. In their study, they concluded that PU and PEU are the two key drivers of people's attitudes.

H6a: *Perceived usefulness has a positive effect on the attitude of e-learning system*
H6b: *perceived ease of use has a positive effect on the attitude of e-learning system*

The concept of PLF refers to a user's intrinsic motivation for engaging in an activity solely for the sake of enjoyment of that activity [6]. It is more likely that employee participation in the information system will be sustained by those who experience more PLF [36]. [41] argue that individuals will have a greater likelihood of having an optimistic attitude and outcomes if the environment is computer-based and supportive. In a study by [49], it was found that PLF is one of the biggest factors driving attitudes toward e-learning among individuals. A study conducted by [82] revealed that PLF has a positive effect on attitudes regarding the use of portal websites. Therefore, based on the above argument, this study formulates the following hypothesis:

H6c: *playfulness has a positive effect on the attitude of the e-learning system*

2.7 Playfulness, perceived usefulness, and behavioral intentions

The studies of E. Park and [64] inspired Moon and Kim to include the concept of Perceived PLF in TAM. It is the belief that an individual has about the system that determines their perceived PLF. In past studies of information technology (IT), PLF of products or services significantly impacted the satisfaction of users [53, 54]. PLF relates to a person's intrinsic motivation to act for the sake of pleasure [8]. A playful workplace is more inclined to endure employee involvement using an information management system [63]. [41] argues that individuals' attitudes and outcomes will improve if they are exposed to a technology-based environment that encourages collaboration. According to [36, 37], PLF plays a key role in driving BI to adopt e-learning systems. [82] also found that PLF affects attitudes and intentions regarding portal use. The study by [84] found that perceived PLF was the most significant antecedent to BI. In some studies, PU was found to be a major component of the probability of users adopting the online system [64]. Scholars are of the opinion that PU plays a significant role in promoting psycho-cognitive shifts in consumers' decision-making processes and influencing their decisions [66, 22]. As a result, the following hypothesis is proposed:

H7: *Playfulness has a positive effect on behavioral intentions*
H8: *Playfulness has a positive effect on behavioral intentions*

2.8 Employee's attitude and behavioral intentions

A scholar defines attitude toward technology as the overall emotional reactions induced by using innovative technology. An individual's BI to use new technologies is defined as their willingness to continue to use them [12]. In contrast, recent IT adoption studies have argued that understanding BI requires consideration of an individual's attitude [42]. It is said that "when all things are in balance, people make

intentions to perform behavior toward which they are positive" [42, 52] concluded that individuals who interact with technology tend to encounter both pleasant and unpleasant situations at the same time. The assessment of behavior by [56] suggests that individual beliefs are one of the variables that define attitudes toward behavior. There has been extensive research conducted in the past on attitudes toward information systems. Similarly, [74] proposed that ATTs toward IT adoption would affect IT adoption intentions. As a result, this study proposes the following proposal in light of the aforementioned reasoning:

H9: *Employee's attitude has a positive effect on behavioral intentions*

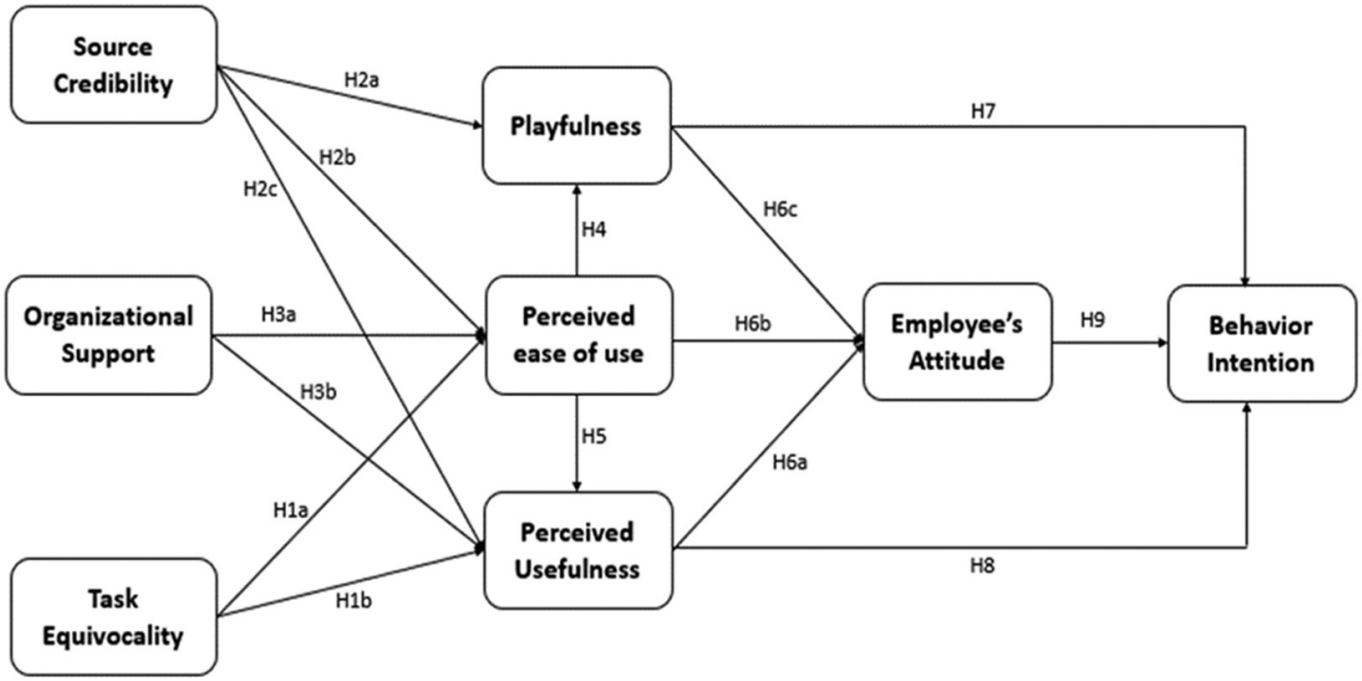

Fig. 1. Research model

3 RESEARCH METHOD

3.1 Data and sample collection

This investigation used an online survey and a mail survey to gather relevant data for the empirical examination of the descriptive studies. It is not possible to collect a random sample of all end-users of mobile e-learning systems in Malaysian organizations because a trustworthy sampling frame is missing. Thus, this study used non-probability sampling (e.g., convenience sampling) for data collection rather than random sampling. This study collected sample data from four industries in Malaysia where e-learning is widely used [78], such as manufacturing, marketing and service, information technology, and telecommunications, to improve the likelihood that the results can be applied broadly. Our study examined 16 companies with mobile e-learning systems (four per industry). Several companies in Malaysia provide e-learning training systems.

Two hundred online surveys and four hundred paper surveys were sent out, with an estimated 380 completed and returned. 23 questionnaires were uncompleted

and not used, resulting in 357 valid questionnaires. This study analyzed 357 completed questionnaires and found that 59.5% of respondents answered. The researchers interviewed 357 employees, 35.3% of whom were between 23 and 27 years old and 55.7% between 28 and 30. It was estimated that 73.4% of respondents were male and 26.6% were female. A total of 47.3% of respondents had a master's from a college or university; 9% had completed a PhD degree. 43.7% of respondents worked in the IT sector.

3.2 Measures

This study adapted an existing questionnaire for its survey from other studies and authors to better suit the needs of the current investigation. A study by [30] provided the basis for SCR. A sample item is, "The person providing the information system training was trustworthy." Items of OS have been taken from the study of [39]. A sample item is, "My organization provides opportunities to obtain information through an e-learning platform." According to [52, 55, 63], this study assessed employees' TE by utilizing two items. For instance, "To accomplish my work effectively, I often have to adapt new techniques or processes. The following items are taken from [57, 58, 59] to study PLF, PEU, and PU. Some examples of responses include, "I think e-learning enables me to expand my creativity by collecting knowledge," "I believe e-learning materials are educational," and "I find the e-learning system to be straightforward to use." [63] Study found that BI consists of three factors, and attitude consists of three factors. Both "I think that working with computers is extremely tough" and "I will highly suggest people to utilize it" fall into this category.

4 RESEARCH RESULTS

4.1 Verification of the measuring model

This research used correlation analysis to look at the connections between the variables. A very substantial correlation between the two variables was found via statistical testing. When evaluating concept validity, this research employed the AVE square root. Evidence for discriminant validity is provided by the data since the square root of AVE is larger than its correlation with other variables [5]. It is also possible to evaluate discriminant validity by comparing AVE to its MSV value across all components. It is considered to have discriminatory validity if AVE is greater than MSV. According to [43], Discriminant validity model selection suggests that the AVE's square root is more predictive than the AVE itself. [43] further demonstrates that the composite dependability (CR) values for all variables are greater than 0.70, ranging from 0.842% to 0.899 [45, 46, 47]. We then used AVE and item loadings to perform a convergent validity test, which looked at the likely relationship between these items [47]. All AVE values are greater than 0.5, showing that the variables are both acceptable and much more variable than the minimum required by the criterion.

4.2 Reliability analysis

Cronbach's alpha was utilized to examine internal consistency across all components in this research. According to the findings, the Cronbach alpha for all constructs was greater than 0.70, which is commendable according to [46, 47], proving

the validity of the data. A CR estimate was run to check the consistency across all of the variables. The research shows that the CR values are higher than the threshold of 0.70 [47].

4.3 Common method variance

The common method variance (CMV) has been measured using a wide range of statistical and methodological techniques. The items were first created with simplicity, clarity, and precision in mind, and then a pilot study was conducted to determine which instruments would work best [79]. Second, if a single component accounts for at least half of the total variation, as shown by Harman's model, then CMV impacts [79]. This research confirmed that the data did not include CMV since the most significant component explained just 26.89% of the variance (less than the 50% cutoff). To examine the CMV, [28, 36] thirdly looked into the association between latent variables. There is no pairwise correlation above 0.90 between any of the variables. As a result, our statistical evaluations rule out the presence of common method variance.

4.4 Multicollinearity

To check for multicollinearity concerns and determine the values of the threshold and variance inflation factor (VIF), a regression test is performed. The VIF value must not be more than 0.3 [40]. Based on the findings, this model does not exhibit multicollinearity problems since the scores of VIF and threshold are within each variable's recommended ranges [23, 24, 25].

4.5 The model's predictive ability (Q2)

The Stone and Geisser test in SmartPLS was used to evaluate the structural validity of our model. For a particular conceptual model, its predictive capacity is assessed by whether or not its Q2 value is larger than zero (>0) [47]. Because of this, we know the route model is correct because Q2 for every path's dependent variable is larger than zero (see Table 1).

Table 1. General model blindsight statistics

Construct	SSO	SSE	(Q^2= 1-SSE/SSO)
Behavioral Intention	800	635.121	0.206
Employee's Attitude	800	689.25	0.138
Organizational Support	800	611.58	0.235
Perceived Ease of Use	1000	947.225	0.052
Perceived Usefulness	800	694.772	0.132
Playfulness	1000	850.359	0.150
Source Credibility	1000	648.514	0.189
Task Equivocality	1000	658.455	0.116

4.6 Structural model and hypothesis outcomes

The purpose of this research was to examine the validity and reliability of our reliable measures as well as the hypothesized connections between them and the provided model. Figure 2's R^2 value of 0.603 confirms the existence of a relevant explanation as it is higher than the minimal threshold of 0.35 [33]. The SEM technique and a covariance-based regression analysis were also used to verify the hypothesized connection between the variables in the model. The findings show that the f-value for linearity between all linkages is very high. To further prove the suitability of the suggested structural model to our data (i.e., Chi-Square = 564.637, NFI = 0.805, and SRMR = 0.061), this research further conducted a battery of fitness tests [60].

Analysis of the findings revealed that TE had a considerable favorable effect on PEU. (H1a–$\beta_{TE \rightarrow PEU} = 0.384$, $p < 0.05$) and PU (H1b–$\beta_{TE \rightarrow PU} = 0.368$, $p < 0.05$). Furthermore, SCR has a positive and significant association with PLF (H2a–$\beta_{SCR \rightarrow PLF} = 0.225$, $p < 0.05$), PEU (H2b–$\beta_{SCR \rightarrow PEU} = 0.217$, $p < 0.05$), and PU (H2c–$\beta_{SCR \rightarrow PU} = 0.250$, $p < 0.05$). So, it agrees with both the first and second hypothesis. Furthermore, the direct effect of the third hypothesis showed that OS had no discernible association with PEU. (H3a–$\beta_{OS \rightarrow PEU} = 0.299$, $p < 0.05$) and insignificantly related to PU (H3b–$\beta_{OS \rightarrow PU} = 0.009$, $p > 0.05$). In addition, PEU has a positive and substantial impact on PLF (H4–$\beta C_{PEU \rightarrow PLF} = 0.574$, $p < 0.05$) and PU (H5–$\beta C_{PEU \rightarrow PU} = 0.261$, $p < 0.05$). Furthermore, findings indicated that PU (H6a–$\beta_{PU \rightarrow ATT} = 0.114$, $p < 0.05$), PEU (H6b–$\beta_{PU \rightarrow PEU} = 0.313$, $p < 0.05$), and PLF (H6c–$\beta_{PLF \rightarrow ATT} = 0.279$, $p < 0.05$) have a positive influence on ATT, therefore, our 6th hypothesis supported the study. In hypothesizing H7 & H8, this study finds that the PLF (H7–$\beta_{PLF \rightarrow BI} = 0.271$, $p < 0.05$) and PU (H8–$\beta_{PU \rightarrow BI} = 0.426$, $p < 0.05$) have a significant effect on BI. In last, employees' attitudes were significantly and positively related to BI (H9–$\beta_{ATT \rightarrow BI} = 0.186$, $p < 0.05$). As a result, our study's hypotheses H9 were supported. Table 2 represents the testing results of all Hypotheses.

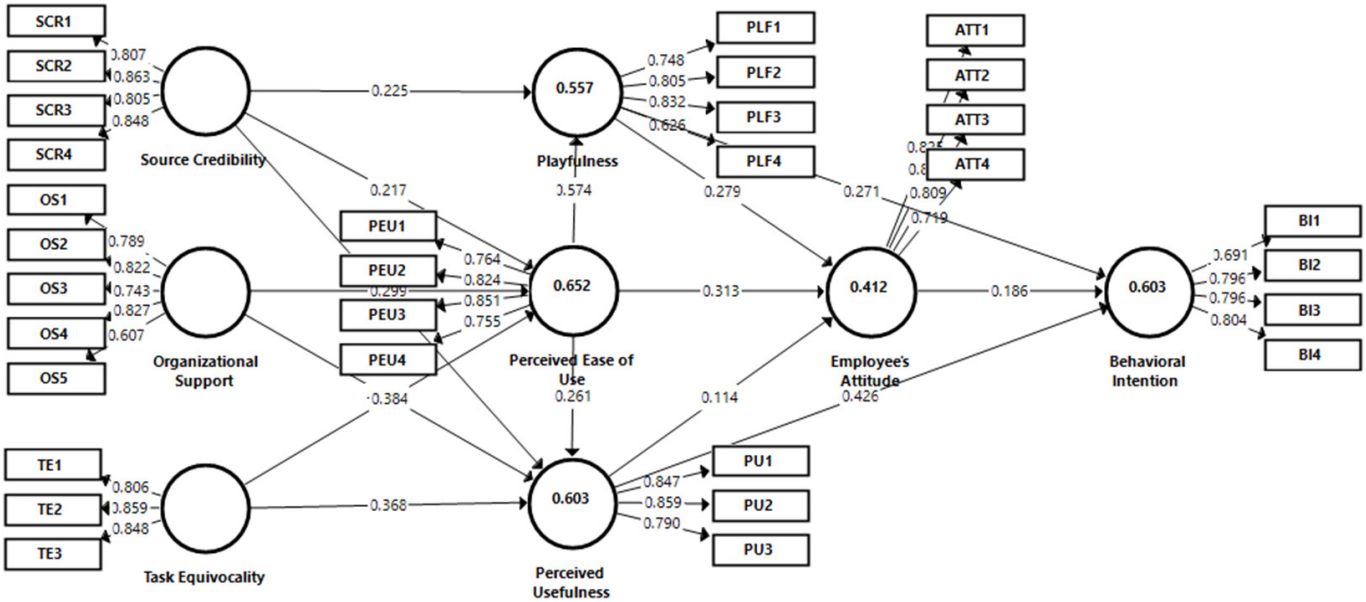

Fig. 2. Results of hypotheses

Table 2. Hypotheses testing

	Hypotheses	Beta	S.D	*t*-Values	*p*-Values
H1a	Task Equivocality -> Perceived Ease of Use	0.384	0.086	4.472	0.000
H1b	Task Equivocality -> Perceived Usefulness	0.368	0.099	3.726	0.000
H2a	Source Credibility -> Playfulness	0.225	0.089	2.528	0.012
H2b	Source Credibility -> Perceived Ease of Use	0.217	0.095	2.285	0.023
H2c	Source Credibility -> Perceived Usefulness	0.250	0.091	2.733	0.006
H3a	Organizational Support -> Perceived Ease of Use	0.299	0.079	3.772	0.000
H3b	Organizational Support -> Perceived Usefulness	0.009	0.101	0.089	0.929
H4	Perceived Ease of Use -> Playfulness	0.574	0.084	6.814	0.000
H5	Perceived Ease of Use -> Perceived Usefulness	0.261	0.080	3.282	0.001
H6a	Perceived Usefulness -> Employee's Attitude	0.114	0.130	0.879	0.380
H6b	Perceived Ease of Use -> Employee's Attitude	0.313	0.064	4.913	0.000
H6c	Playfulness -> Employee's Attitude	0.279	0.123	2.270	0.024
H7	Playfulness -> Behavioral Intention	0.271	0.088	3.088	0.002
H8	Perceived Usefulness -> Behavioral Intention	0.426	0.080	5.329	0.000
H9	Employee's Attitude -> Behavioral Intention	0.186	0.079	2.356	0.019

5 RESEARCH DISCUSSION

The TAM model was especially used in this research because it explains why a given scenario can result in different outcomes for the system's acceptance [65]. According to the research findings, it is possible to infer that SCR plays a crucial role in influencing the PLF, PEU, and PU of persuasive messages. Consistent with the previous findings, [30] claims that supplementary cues, such as the credibility of the source, may affect human behavior. The employees are more likely to seek out information, and their imagination is more likely to be positive when they are confident in the credibility of the source [6]. It is more enjoyable for a person to accept a system when it is accompanied by information that comes from credible sources. A source's credibility may have a positive impact on employee cognitive evaluations, such as their perceptions of PU and ease of use.

Moreover, the findings of this research reveal that OS and TE significantly affect PEU and PU, which in turn influence intentions to use. This study confirms previous findings [66] that workers are more likely to assume that online learning platforms are helpful and easy to use when they are provided with assistance and other resources from top management. As reported in previous research, these findings also suggest that OS influences both individual and organizational performance. It is therefore important that managers provide employees with OS to improve their perception of ease of use regarding e-learning platforms [31]. Similarly, our findings reveal that TE has a favorable impact on PEU and PU. Our results support prior studies indicating a favorable connection between task attributes and PEU and perceived usefulness.

It can be concluded from the research findings that the TAM provides scholars with an appropriate, theoretically sound framework for predicting workers' willingness to use mobile e-learning systems in their workplaces. The outcomes suggest that PEU and PU have an impact on employees' intentions to adopt e-learning platforms. The findings of this experiment confirm previous findings that both PU and PEU play an important role in influencing the adoption of e-learning systems adoption in organizations [35].

6 RESEARCH IMPLICATIONS

As a result of the above discussion, several managerial implications can be drawn. The present study argued that employees' perceptions of PU and PEU are not the primary elements that influence system acceptance; emotional responses are also important. In the authors' opinion and to the best of their understanding, this study provides the first scientific claim of how persuasive messages influence functional responses toward the implementation of a new system. Given these consequences, it can therefore be anticipated that SCR is a crucial factor in creating effective messages as well as generating different types of responses. Those employees who are more likely to elaborate on the system should be provided with information regarding its value, benefits, and advantages. It is possible to influence employees' perceptions of a new system's PU and PEU by conveying a clear message and communicating useful arguments at the same time. In the course of implementing technology, it is also significant to consider the effect of influencing routes on employee PLF, PEU, and PU attitudes and BI. This study found that PLF or PU directly affects behavior intention through attitude influence.

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