A Study on Adoption of Mobile Learning Apps (MLA) : Development of an Integrated Framework in a Multinational Context

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Abstract

Purpose : In this study, we provided an integrated framework to assess the determinants of intention to adopt and recommend mobile learning apps (MLA) in an emerging economy context.

Methodology : We integrated diffusion of innovation (DOI) & DeLone and McLean's information systems success model (D&M ISS Model). Four independent measures, compatibility, complexity, system quality, and information quality, were taken from the mentioned theories. Intention to adopt and intention to recommend are the dependent constructs. Intention to adopt also plays the role of mediator. Three hundred seventy-two participants from Saudi Arabia and India were included in the survey. Partial least squares (PLS) structural equation modeling (SEM) was used for the analysis.

Findings : The results suggested that all the antecedents influenced the intention to adopt and recommend except for compatibility. Compatibility affected adoption intention only. The intention to adopt had a substantial impact on the recommendation intention. It also successfully mediated all the proposed relationships. In addition, a multi-group analysis (MGA) was also conducted to have country-specific results.

Originality : We provided a new, comprehensive, and integrated model to assist learning app companies in implementing new technology. Two significant theories were integrated to provide a holistic and futuristic framework.

Keywords : **compatibility, complexity, system quality, information quality, intention to adopt, intention to recommend, Saudi Arabia, India**

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M-learning or mobile e-learning uses mobile technology. E-learning is computer-aided learning (Camilleri & Camilleri, 2020). M-learning, like e-learning, offers multimedia content and student communication, but it can be done anywhere and at any time. Mobile devices may be brought anywhere, used to access information instantly (Chakraborty, 2022), and utilized to search and gather actual or simulated data. These three things about m-learning can change the way students learn. Also, new, more advanced

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hardware (cameras) and software give mobile devices more ways to organize, change, and create information (Drolia et al., 2022). Mobile technology, especially applications, have excellent educational potential, especially in universities. In recent years, smartphone processing capability, acceptance, mobile broadband connectivity, and pricing have changed. Educational apps and cheaper mobile internet are helping the mobile learning revolution. Mobile apps in learning and teaching have been proven to keep students engaged and improve learning. However, mobile app use and perceived learning needs are understudied, especially in Asia. Mobile apps are a vital new technology that helps consumers buy products/services (Chakraborty et al., 2022; Hamidi & Chavoshi, 2018). Students and teachers are adopting smartphone apps for learning. As a result, app integration choices in education are expanding at a quicker rate than ever before. The number and diversity of apps continue to rise due to the high demand. Aside from newly developed apps, some popular desktop programs and web services, such as social networking sites, professional networking sites, news websites, and educational apps, have been moved to mobile devices (Wai et al., 2018).

Mobile technology has recently been repositioned as more than just a communication tool (Wai et al., 2018). Researchers realize that mobile technology is increasingly used as a learning tool due to wireless network expansion and device capabilities (Caudill, 2007). Students' learning appears to be aided by portable technologies such as cell phones, tablets, and e-book readers (Dash, Akmal, Mehta, & Chakraborty, 2022; Huang, 2013). Although studies in several disciplines are relevant, most focus on three key areas: distance learning, linguistic studies, and library and information science (Wai et al., 2018). Researchers have emphasized the importance of a student's personality and how it differs from its predecessors. Nowadays, students are heavily impacted by technological advancements. This generation is often well-versed in using high-tech equipment and frequently accessing essential information via wireless internet (Corlett et al., 2005). Institutions are also experimenting with digital regulations allowing more interactions between students when working on projects and evaluations to enhance real-time skills. Mobile learning research has recently turned from assessing mobile learning in general to examining the production and use of mobile apps for higher education.

2020 has been particularly difficult for learners, where eLearning services were the ray of hope in the turmoil (Dash, 2022). Our unique study examines the elements that drive mobile learning apps' (MLA) adoption and recommendation intents, providing helpful information to technology professionals, particularly mobile learning app developers in emerging nations. This research is critical for consumers who have embraced or are considering adopting MLA services. Prior studies have shown that using mobile apps in learning and teaching can assist students in staying interested in class while significantly impacting student learning. However, there is a lack of study on mobile apps and perceived learning needs, particularly in Asian countries. We examined several existing technology adoption frameworks/models to produce an integrated and holistic model/framework that is universally applicable. We merged DOI (diffusion of innovation) with DeLone and McLean's information systems success model (D&M ISS Model). The framework for studying MLA adoption factors has been upgraded and combined with theoretical model constructions. We conducted an international study that compares two developing economies. MLA is a blessing in disguise for both learners and instructors. The present pandemic makes a compelling justification for establishing a universal MLA framework, and our research aims to close that gap. The study's goals are:

- To identify the elements influencing intentions to adopt and recommend mobile learning apps.
- To measure the mediating effect of intentions to adopt amongst all the associations.
- To compare MLA adoption and recommendation in the context of two emerging economies, India & Saudi Arabia.
- To develop a comprehensive and forward-thinking framework for MLA adoption with global ramifications.

Theoretical Background

Diffusion of Innovation (DOI)

The DOI is one of the most popular models of recent years. It has been widely accepted in marketing, IT, agribusiness, communication, and education. Innovation is implementing a novel concept by an individual or a group (Min et al., 2021; Rogers, 2003). DOI is a model based on the user's belief in the most recent innovation (Bharadwaj & Deka, 2021). The DOI model takes into account that diffusion is constantly changing. Diffusion spreads new ideas through different social systems over time using various methods (Dash et al., 2023; Lin & Bautista, 2017). DOI is a model that says the customer decides whether to accept or reject an innovation based on what he or she thinks about it (Zhang, 2018). Since its creation, the diffusion of innovation (DOI) theory has been a milestone in explaining how a product or service starts, gains popularity, and spreads throughout society (Rogers, 2003). A fresh idea spreads through a community over time through diffusion (Maki & Vishwanath, 2020). This study is the first to combine the DOI and D&M ISS models in the context of technology adoption in an emerging country, evaluate them, and determine their similarities and differences. This study examines what makes people use mobile learning apps in India and Saudi Arabia, the top emerging economies. From the DOI theory, we have taken compatibility and complexity as independent constructs.

DeLone and McLean's Information Systems Success Model (D&M ISS Model)

Mobile apps now have a significant effect on how people live their lives. They provide information 24/7, let companies reach a wide range of consumers, and change how people do their daily tasks more and more (Balaban et al., 2013; Delone & McLean, 2003). The information systems success model measures how the system, information, and service quality affect user happiness and e-commerce success (DeLone & McLean, 2003). Theoretical bases for the study should include post-adoption behaviors like loyalty and intention to suggest. M-banking, m-healthcare, m-payment, m-travel, m-shopping, m-learning, m-dating, and others benefit from mobile apps (Edrees, 2013). Many academics have used the information systems success model to explain mobile app functionality and user behavior (DeLone & McLean, 2003). It attempts to explain how information systems perform well (Chakraborty & Altekar, 2021a). It discusses how six key factors — information quality, system quality, service quality, system use/usage intention, user happiness, and net system benefits — affect information system performance (Hsu et al., 2015). We have taken system and information quality from this theory as independent constructs.

Literature Review and Hypotheses Development

Compatibility, among the five traits of IDT, shows a constant association with the adoption of innovation, or we can say that high compatibility significantly increases the tendency to innovation adoption (Rogers, 2003). Compatibility, directly and indirectly, affects learners' intention to use m-learning (Cheng, 2015). Compatibility has a direct and positive effect on learners' PU (perceived use), PEOU (perceived ease of use), and intention to use m-learning (Cheng, 2015). Also, compatibility increases user satisfaction and trust, which strongly influences the intention to recommend, furthering its association to adopt and recommend (Al-Ansi et al., 2019; Aldholay et al., 2020). Thus, we propose the following:

- **H1(a) :** Compatibility has a positive impact on the intention to adopt.
- **H1(b) :** Compatibility has a positive impact on the intention to recommend.

Complexity reduces perceived ease of use and further users' association level; on this account, it can be specified that a lower level of complexity gives an increased result related to mobile app use (Oh & Kim, 2022; Reychav & Wu, 2016). Lower complexity encourages technology adoption because when learners perceive any technology as complex or challenging, they are less likely to adopt it. Thus, it can be summarized that the lower the perceived complexity, the higher the intention to adopt (Akour et al., 2022). Complexity indicates learners' perceived difficulty, which hurts learning performance. Innovational technology is required to be easily accessible and user-friendly in order to get adopted rapidly. When perceived complexity is low, the learners' high satisfaction level will lead to a higher recommendation intention (Akour et al., 2022; Kang & Choi, 2018). Hence, we propose the following:

- **H2(a) :** Low complexity has a positive impact on the intention to adopt.
- **H2(b) :** Low complexity positively impacts the intention to recommend.

System quality is an essential factor that positively impacts mobile learning app usage among learners during COVID-19 (Almaiah et al., 2022). System quality signifies the number of desirable characteristics like flexibility, user-friendly, responsiveness, reliability, security, etc., which should meet the learner's expectations, thereby improving the actual use of mobile learning applications (Althunibat et al., 2021). System quality positively affects acceptance of the technology and intention to use the mobile learning app. During the COVID-19 pandemic, system quality has shown high importance in learner's association, thus positively influencing the acceptance of mobile learning apps (Althunibat et al., 2021). Furthermore, higher customer satisfaction leads to higher intention to purchase (Dash et al., 2021) and recommend (Kang & Choi, 2018), and system quality is the essential quality impacting m-learning app usage. Hence, we posit:

- **H3(a) :** System quality has a positive impact on the intention to adopt.
- **H3(b) :** System quality has a positive impact on the intention to recommend.

Information quality is a vital variable in online learning which positively affects the intention to use mobile learning (Gharaibeh & Gharaibeh, 2020). Information quality is a necessary construct that significantly impacts the user's behavioral intention, directly related to the intention to adopt m-learning (Basurra & Bamansoor, 2021; Cheon et al., 2012). Researchers identified that information quality is essential to learners' contentment, hence the intention to use mobile learning (Arain et al., 2019). High information quality, which meets the requirement of the learners, develops a positive intention to use m-learning and a stronger intention to recommend (Kang & Choi, 2018; Lutfi et al., 2022). Thus, we posit that:

- **H4(a) :** Information quality has a positive impact on the intention to adopt.
- **H4(b) :** Information quality has a positive impact on the intention to recommend.

Researchers have always shown interest in exploring various factors associated with students' adoption of mobile learning (Kim et al., 2017). The intention to recommend is an opinion of an already experienced person about any product or service. It is a word-of-mouth communication that shows a strong association to be adopted by a customer who is quite satisfied with his/her personal experiences (Hosany et al., 2017). Usually, the intention to recommend is associated with users' experience and future expectations; hence, the intention to adopt is a vital predictor of the intention to recommend (Kang & Choi, 2018). Hence, it can be hypothesized that:

- **H5 :** The intention to adopt positively impacts the intention to recommend.

The Mediating Role of the Intention to Adopt

Technology compatibility affects the users' perceived playfulness, usefulness, ease of use, and entertainment, thus developing an intention to adopt m-learning (Cheng, 2015). A satisfied customer shows optimistic behavior towards the intention to recommend (Kang & Choi, 2018). Thus, we see that intention to adopt mediates compatibility and the intention to recommend. Similarly, people always want to see an innovation's relative advantage or better performance, encouraging them to adopt it (Chakraborty & Altekar, 2021b; Wang, 2022). This advanced innovation or m-learning builds trust, directly and strongly influencing the intention to adopt and recommend (Yuliana & Wahyudi, 2021). Relative advantage, complexity, and compatibility are the three factors found to be reliable in adopting innovation (Rogers, 2003), among which complexity shows an inverse relationship with the ease of use that affects the adoption. The lower the complexity of the m-learning app, the higher the intention to adopt, which mediates the intention to recommend. Hence, we propose the following hypotheses :

- **H6(a) :** Intention to adopt mediates the association between compatibility and intention to recommend.
- **H6(b) :** Intention to adopt mediates the association between complexity and intention to recommend.

In a similar pattern, if we see factors like system quality and information quality, it can be easily understood that these qualities build a robust positive association among the users leading to the adoption of mobile learning app usage (Lee & Jeon, 2020). Additionally, the higher the quality levels, the higher the association towards m-learning app usage and, in turn, the higher intention to recommend (Arain et al., 2019; Kang & Choi, 2018). Adopting any technology depends on the system's quality which is decided by the extent of availability of the desired features. The richness of the information furthers the adoption too. Again, the recommendation intention is boosted by the adoption intention that acts as the mediator between the qualities and the intention to recommend (Arain et al., 2019; Dash, Akmal, Mehta, & Chakraborty, 2022; Dash, Chakraborty, & Alhathal, 2022; Lee & Jeon, 2020). Hence, we propose the following hypotheses:

- **H6(c) :** Intention to adopt mediates the association between system quality and intention to recommend.
- **H6(d) :** Intention to adopt mediates the association between information quality and intention to recommend.

Figure 1 summarizes all the proposed hypotheses.

Figure 1. *Conceptual Model*

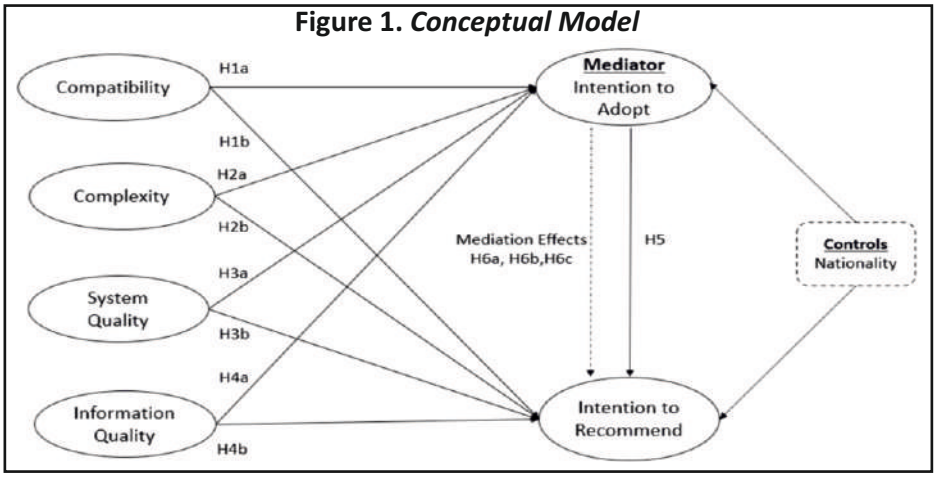


Table 1. ***Participant Details***

		Country/ Nationality					
		India		Saudi Arabia		Total	
Gender	Female	99	47.8%	73	44.2%	172	46.2%
	Male	108	52.2%	92	55.8%	200	53.8%
	Total	207	100.0%	165	100.0%	372	100.0%
Age (Years)	<= 30	103	49.8%	89	53.9%	192	51.6%
	31–45	81	39.1%	55	33.3%	136	36.6%
	>=46	23	11.1%	21	12.7%	44	11.8%
	Total	207	100.0%	165	100.0%	372	100.0%
Qualification	HSC	90	43.5%	94	57.0%	184	49.5%
	Graduate	72	34.8%	51	30.9%	123	33.1%
	Postgraduate	45	21.7%	20	12.1%	65	17.5%
	Total	207	100.0%	165	100.0%	372	100.0%

Methods

Study Data, Instrument, and Sample

We followed three research design steps. We began with an appropriate sample design, then moved on to data collection design, and ultimately data collecting instrument design. First, a descriptive and cross-sectional investigation was adopted. Learners and trainers were included in the sampling frame for sample formation from both the countries, India & Saudi Arabia. Because the study is transnational, it focused on two countries: Saudi Arabia and India. These two countries are leading the GDP growth rates among large economies (Narayanan, 2023). The sample was derived from the defined sample frame using a purposive-cum-stratified sampling design. Four institutions and universities were targeted for the same. Surveys were performed online and offline for a hybrid approach (Hair Jr. et al., 2010; Malhotra et al., 2006). The main instrument was a structured questionnaire with screening questions in place. Three hundred seventy-two participants were finalized after checking the consistency and completion criteria (Hair Jr. et al., 2010; Malhotra et al., 2006). The sample size was enough to conduct further analysis (>21*15=335). Table 1 provides the socio-demographic details of the participants in a two-nation format.

Scale Development and Validity

As stated in the conceptual model, six constructs with 21 items are used in the study. The four independent constructs are taken from the two major theories (DOI and IS Success model). All the items under these constructs and their sources are provided in Table 2. A 7-point scale was used for all these statements (1= *strongly disagree* to 7 = *strongly agree*). Complexity was reverse-coded to reflect the meaning of low complexity as per existing literature. All the reliability and validity measures were higher than the threshold values. Smart PLS 4 (Ringle et al., 2022) was the chosen software package for data analysis. First, the internal consistency of the constructs is assessed by Cronbach's alpha. All values are above the recommended level of 0.7 (Dash & Paul, 2021; Hair Jr. et al., 2010). Next, convergent validity is measured with the help of composite reliability (CR), factor loadings, and the average variance extracted (AVE). All the factor loadings are above 0.6, CR values are above 0.7, and AVE

Table 2. ***Constructs and Items***

Constructs and the Items	Factor Loading	Sources
Compatibility *(CMPT)* (DOI) AVE = 0.78 ; CR = 0.88 ; α = 0.86		
The convenience of mobile learning apps (MLAs) fits well with my lifestyle.	0.81	(Bharadwaj & Deka, 2021 ;
The way I handle my learning is a good fit for using MLAs, so I do that.	0.88	Rogers, 2003 ; Urbach & Müller, 2012)
The use of MLAs complements the way I want to work.	0.92	
Using MLAs is entirely compatible with my current situation.	0.86	
Complexity *(CMPX)* (DOI) AVE = 0.77 ; CR = 0.92 ; α = 0.88		
Using mobile learning apps (MLAs) requires much mental effort.	0.93	(Bharadwaj & Deka, 2021 ;
It is possible that using MLAs will drive you crazy.	0.81	Rogers, 2003 ; Urbach & Müller, 2012)
Learning and experience are prerequisites for using MLAs.	0.91	
In my opinion, using MLAs requires much extra effort.	0.79	
System Quality *(SYQ)* (IS Success Model) AVE = 0.71 ; CR = 0.88 ; α = 0.79		
It creates an audio-visual experience.	0.91	(DeLone & McLean, 2003 ; Singu
It provides features that are relevant to these services.	0.92	& Chakraborty, 2022 ; Zhou, 2012)
I can use MLA services whenever I want.	0.68	
Information Quality *(INQ)* (IS Success Model) AVE = 0.72 ; CR = 0.91 ; α = 0.87		
MLAs give me information that is useful to me.	0.87	(Singu & Chakraborty, 2022 ; Zhou, 2012)
MLAs give me enough information to make a decision.	0.83	
I get accurate information from MLAs.	0.91	
MLAs let me know what is going on right now.	0.78	
Intention to Adopt *(ITA)* AVE = 0.73 ; CR = 0.8 ; α = 0.73		
In the future, I plan to use MLAs to learn.	0.86	(Singh et al., 2020 ; Teo et al., 2003)
In the future, I will use the MLAs to learn.	0.8	
In the future, I will often use MLAs to learn.	0.88	
Intention to Recommend *(ITR)* AVE = 0.74 ; CR = 0.91 ; α = 0.82		
I would recommend MLAs to my friends and family to use if it is available.	0.96	Singh et al. (2020)
If I have a good experience with MLA services, I will tell my friends to download the apps.	0.93	
I would recommend the apps on social platforms if these are worth using.	0.62	

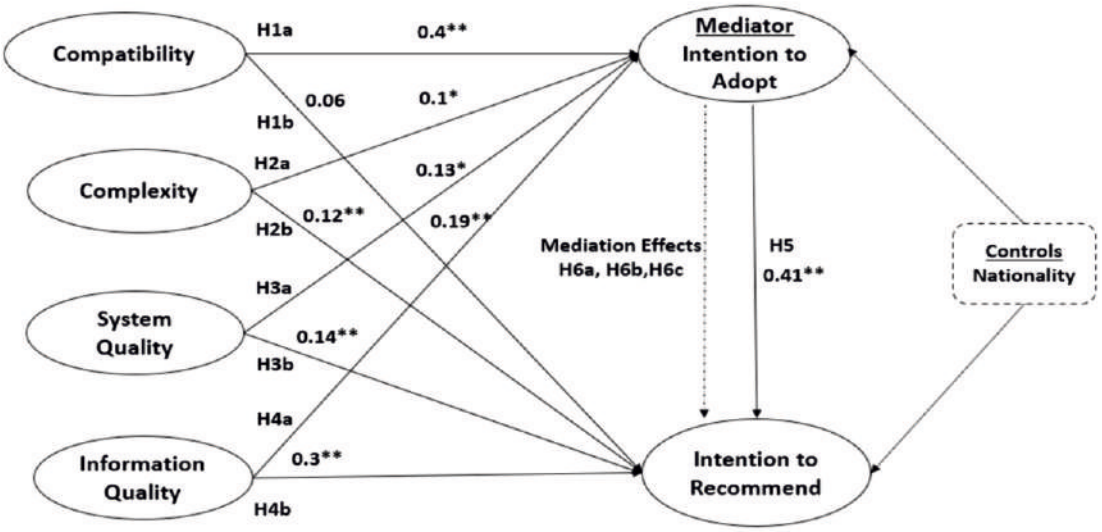
values are above 0.5 (Dash & Paul, 2021; Hair Jr. et al., 2010). In addition, the heterotrait-monotrait (HTMT) (Henseler et al., 2015) analysis is done to check the discriminant validity. No values are found to be above 0.9. Hence, the measurement model is found to be reliable and valid.

Analysis and Results

Structural Model (SEM)

In this study, we adopted the partial least squares (PLS) structural equation modeling (SEM) approach (Ringle et al., 2022). Figure 2 shows the results of all nine proposed direct hypotheses (H1 – H5). Intention to adopt has an R^2 value of 0.36, and intention to recommend has 0.53, indicating an excellent predictive power of the model.

Figure 2. ***SEM Results (PLS)***



Note.*Significant at 5%; **significant at 1%.

Table 3. ***Multi-Group Analysis (MGA)***

Hypothesis	Hypothesized Relationship			Sample 1 Estimate	Sample 2 Estimate	Group Differences (*p*-value)
H1(a)	*CMPT*	→	*ITA*	0.45**	0.28**	0.15
H1(b)	*CMPT*	→	*ITR*	0.02	0.13*	0.14
H2(a)	*CMPX*	→	*ITA*	0.02	0.29**	**0.00**
H2(b)	*CMPX*	→	*ITR*	0.1*	0.12*	0.69
H3(a)	*SYQ*	→	*ITA*	0.18*	0.06	0.27
H3(b)	*SYQ*	→	*ITR*	0.15*	0.05	0.34
H4(a)	*INQ*	→	*ITA*	0.14*	0.29**	0.24
H4(b)	*INQ*	→	*ITR*	0.26**	0.39**	0.16
H5	*ITA*	→	*ITR*	0.48**	0.3**	0.08

Note. *significant at 5% ; **significant at 1%. Please refer to Table 2 for the construct names.

Furthermore, the path coefficients generated by PLS-SEM show that compatibility, complexity, system quality, and information quality positively and significantly impact the intention to adopt. Hence, H1(a), H2(a), H3(a), and H4(a) are accepted. However, regarding their impact on the intention to recommend, except compatibility, rest three have a positive and significant impact. Hence, H2(b), H3(b), and H4(b) are accepted, while H1(b) is rejected.

Multi-Group Analysis (MGA)

The differences between the two countries regarding the proposed hypotheses are assessed as the study proposes nationality as a control variable (Dash, Akmal, & Chakraborty, 2022). All the hypotheses are tested for individual samples. Smart PLS 4 is used to conduct an MGA. Table 3 summarizes the findings. Although there are differences

between the two countries regarding the hypotheses, only one hypothesis is significantly different between them. H2 (a): CMPX → ITA is found to be significantly different for the two nations.

Is "Intention to Adopt" a Good Mediator?

As the study proposes "Intention to Adopt" as a mediator, the indirect effects are measured to compare the direct effects. It is first done for the combined sample (Table 4) and then for individual samples (Table 5). Mediation is full when the indirect effect is significant, and the direct effect is not. If both are significant, then it is partial. If both are insignificant or only the direct effect is significant, there is zero or no mediation (Dash & Paul, 2021; Hair Jr. et al., 2010). For the whole sample, ITA has a full mediation effect on the relationship between CMPT and ITR. Additionally, it partially mediates the other three relationships (H6) (Table 4). Hence, H6(a) – H6(d) are accepted. For India, ITA has a full mediation effect on the relationship between CMPT and ITR, and it partially mediates the relationship between SYQ and ITR. Hence, H6(a) and H6(c) are accepted (Table 5). Finally, for Saudi Arabia, except SYQ→ ITA→ ITR, ITA partially mediates the rest of the proposed relationships. Hence, except H6(c), all are accepted.

Table 4. ***Mediation (Combined Sample)***

ITA as a Mediator				
Relationship	**Hypothesis**	**Direct Effect**	**Indirect Effect**	**Result**
CMPT → ITA → ITR	H6(a)	0.06	0.16**	Full
CMPX → ITA → ITR	H6(b)	0.12**	0.04*	Partial
SYQ → ITA → ITR	H6(c)	0.14**	0.06*	Partial
INQ → ITA → ITR	H6(d)	0.3**	0.08**	Partial

Note. *significant at 5% ; **significant at 1%.

Table 5. ***Mediation Effects (Individual Samples)***

India				
Relationship	**Hypothesis**	**Direct Effect**	**Indirect Effect**	**Result**
CMPT→ ITA → ITR	H6(a)	0.02	0.22**	Full
CMPX→ ITA → ITR	H6(b)	0.1*	0.00	No
SYQ→ ITA→ ITR	H6(c)	0.15*	.1*	Partial Full
INQ→ ITA→ ITR	H6(d)	0.26**	0.07	No
Saudi Arabia				
CMPT→ ITA → ITR	H6(a)	0.13*	0.08*	Partial
CMPX→ ITA → ITR	H6(b)	0.12*	0.08**	Partial
SYQ→ ITA→ ITR	H6(c)	0.05	0.02	No
INQ→ ITA→ ITR	H6(d)	0.39**	0.09**	Partial

Note. *significant at 5% ; **significant at 1%.

Discussion

In this study, we propose four independent antecedents of the intention to adopt (ITA) and the intention to recommend (ITR) derived from two popular technological adoption theories. The study proposes nine direct hypotheses and also assesses the mediator role of the intention to adopt. The results align with the previous findings except for only one hypothesis. The empirical cross-national findings extend the theoretical boundaries with a few implications in addition to directives for the managers in the industry. Both theoretical and practical implications are provided in the next section.

The results show that compatibility has a strong influence on the ITA but not on the ITR. In the following mediation analysis, it is proven that the mediation is full. Compatibility affects ITA directly and affects ITR through a strong indirect effect via ITA. Country-wise, compatibility is a good influencer of ITA for both India and Saudi Arabia. However, it is not a robust antecedent of ITR for India. For Saudi Arabia, it affects the ITR. The findings partially align with previous findings (Al-Ansi et al., 2019; Aldholay et al., 2020; Rogers, 2003). High compatibility (technological) plays a massive role in adopting mobile learning apps. Complexity is reverse coded to make it 'low complexity.' The results show that low complexity strongly influences both ITA and ITR. Mediation analysis also proves the mediating effect of ITA. Country-wise, Saudi Arabian users endorsed low complexity's substantial impact on ITA and ITR. However, Indian users are not so optimistic about the impact of low complexity on ITA. The multi-group analysis also proves that there is a vast difference between the two nations on this hypothesis. Again, the findings align with the previous studies (Akour et al., 2022; Chakraborty, 2018; Chakraborty, 2021; Kang & Choi, 2018; Oh & Kim, 2022; Reychav & Wu, 2016). As the complexity of the apps goes down, the adoption and recommendation go up significantly.

Two qualities are also assessed for their predictive powers. First, system quality has a substantial impact on both ITA and ITR. For India, its impact on both is significant. However, Saudis did not find it strong enough to substantially influence their ITA or ITR. Mediation analysis also proves the mediating effect of ITA on these relationships. These findings strongly align with the existing literature (Almaiah et al., 2022, Althunibat et al., 2021, Kang & Choi, 2018). Therefore, the desirable qualities expected by the consumers must be incorporated into the apps to enhance adoption and recommendation to others. Finally, the impact of information quality on ITA and ITR is assessed. It has a significant effect on both countries. Additionally, ITA is a good mediator between the INQ and ITR. Again, it aligns with the past literature (Basurra & Bamansoor, 2021; Cheon et al., 2012; Lutfi et al., 2022). Consumers hugely seek the richness of information. The app providers must enrich the same, and its quality boosts consumer intentions.

The impact of ITA on ITR is unanimous. ITA has a significant impact on ITR across the samples. All the users, irrespective of nationalities, endorsed the same. It aligns with the previous findings (Hosany et al., 2017; Kang & Choi, 2018). In addition, it successfully mediates the four relationships of the predictors with ITR (Yuliana & Wahyudi, 2021). Adoption intention has a make-or-break role in influencing the recommendation intention of the users. No user wants to recommend an MLA without adopting it first. Both are in sync with each other. The following section provides the implications of this study's results.

Implications

Theory

The research tries to close the gap between the user's psychological attitudes and expectations about how technology can help learners/students learn and their intention to adopt, using nationality as a control variable. First, MLAs have started to be used as supplemental (tutorial) learning tools, which became more critical during

the SARS-Covid 19 pandemic. A new trend is looking at what makes MLAs work and what stops them from working. This study adds to how DOI and the IS Success Model can be used to fill this critical gap. Second, the cognitive outcomes of learning depend on the quality of the content, the quality of the system, compatibility, complexity, and how interactive the learning style is. While looking at the effect of content quality, system quality, compatibility, and complexity as drivers of intention to adopt and recommend, control like nationality add to the literature on intention to adopt because it shows how positive and negative factors cancel each other out. Third, learners cared more about the available facilities, especially in learning. To do this, learners rely more on different platforms to find out what people think about the different people in the industry. It is a new addition to the literature on intention to adopt and recommends where the intention to adopt acted as a mediator. So, this study adds to the research on adoption intention by combining it with the DOI and IS Success Model. Fourth, the study adds to the body of knowledge by examining how the intention to adopt mediates the relationships between the drivers and the intention to recommend, finding new connections between these factors, which have been studied extensively in other studies. So, the research adds to the literature by looking in depth at the factors that affect how people buy services based on technology and innovation. It also looks at a broader range of causes and effects.

Practice

This study provides the following practical implications, considering a "new normal" environment for practitioners (Chakraborty & Dash, 2022; Dash & Chakraborty, 2021). First, learners would benefit the most from this endeavor because they are the essential stakeholder and end-user of these services. Second, it gives MLA service providers a holistic paradigm that will allow them to comprehend their learners' requirements and implement their plans accordingly. Third, this transnational study assists policymakers and governments in developing appropriate strategies, vision statements, and budgets. Fourth, the digital revolution of mobile learning reduces costs while increasing reach to the last person. Finally, it opens new avenues for the different segments of the e-learning industry. In short, compatible and simple apps are the needs of the future. In addition, the quality of the system and the information must be enhanced to connect with digital customers.

Future Directions and Conclusion

Although the study tries to address all the primary objectives, it also has its share of limitations. These limitations provide a few directions for future researchers in this field. First, the study is limited to two emerging economies that can be extended to expanded geographic territories with varied samples. Second, we use nationality as the only control variable. Other socio-demographic variables can be added, e.g., gender, age, education, etc. Third, the developed vs. developing economy context can be applied. Fourth, more technology adoption theories, e.g., TAM and UTAUT, can be explored for antecedents. Fifth, moderators such as visibility, trust, and satisfaction can be added to the model. Sixth, more consequences, such as repurchase and continuous usage intentions, can be explored. Finally, in this study, we have undertaken a quantitative approach. Future researchers can add qualitative aspects with a mixed-method study.

Authors' Contribution

Dr. Ganesh Dash handled the empirical investigation of the study. He chalked out the methodology and conducted the formal analysis and validation, including project administration. Dr. Syed Akmal conducted the literature review. Finally, Dr. Debarun Chakraborty was involved in the conceptualization, theory-building, drafting, and revision of the manuscript.

Conflict of Interest

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial or non-financial interest in the subject matter or materials discussed in this manuscript.

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