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TRAITS CONTRIBUTING TO THE PROMOTION OF THE INDIVIDUAL'S CONTINUANCE USAGE INTENTION AND PERCEIVED VALUE OF M-UNIVERSITY SERVICES

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ABSTRACT

Aim/Purpose	This study aims to examine the roles of key traits of m-university services and their users in promoting two crucial post-adoption outcomes of these services; namely, continuance usage intention and perceived value.
Background	M-university (i.e., a university providing services via mobile technologies) has gained a great interest in the higher education sector as a driver of new business models and innovative service offerings. However, its assessment has been greatly overlooked, especially in evaluating the factors that drive the stakeholders' continuance intention to use it and the determinants of its post-adoption perceived value. Consequently, research efforts undertaking such assessment facets empirically are highly required.
Methodology	An integrated research model that enables such assessment was developed and evaluated using a quantitative research methodology. Accordingly, data were collected using a formulated closed-ended survey questionnaire. The target population consisted of the academic staff of a Saudi public university that has witnessed an extensive adoption of m-university services. The obtained data (i.e., 207 fully completed responses) were evaluated using the structural equation modeling approach.
Contribution	To the best of our knowledge, this is the first study that gains the chance to provide the research community and m-service providers with new knowledge and understanding about the predictors that drive the continuance usage intention and value of m-university services.
Findings	The findings showed that all of the examined traits of m-university services and their users (i.e., reliability, usability, customization, self-efficacy, and involvement) are having positive roles in promoting the continuance intention to use

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	these services, while only two traits (i.e., reliability and involvement) contribute significantly to augmenting the perceived value.
Recommendations for Practitioners	The study recommends developing effective design and implementation specifications that strengthen the contributions of the examined traits in the post-adoption stage of m-university services.
Recommendations for Researchers	Further studies should be devoted to addressing the notable need to assess the factors influencing the adoption of m-university services, as well as to explore which ones are having significant roles in the attainment of post-adoption outcomes.
Impact on Society	The empirical insights provided by the present study are essential for both university stakeholders and mobile service providers in their endeavors to improve the key aspects of the anticipated post-adoption outcomes of the provided services.
Future Research	Further empirical investigations are needed to examine the roles of more m-university services and user traits in achieving a broad range of post-adoption outcomes of such services.
Keywords	m-university, faculty-oriented m-university services, m-university service trait, user trait, continuance usage intention, perceived value

INTRODUCTION

The recent advances in mobile computing and the massive prevalence of its devices and communications have enabled a wide range of industries to have mobile objects (m-object), such as m-bank (Leem & Eum, 2021), m-university (Jaradat, 2010), m-library (X. Wang et al., 2018), and m-retailer (Turban et al., 2018). As for many of these objects, the m-university has gained a great interest in its sector (i.e., the higher education one) in the former few years as a driver of new business models and innovative service offerings. This has stemmed primarily from the advanced digital transformation created by m-university in the higher education environment. Such transformation results in changing diverse aspects of the business, including processes, models, and policies (Benavides et al., 2020). M-university is broadly identified as any university providing services or processes via mobile devices (Jaradat, 2010). Hence, the m-university concept signifies a new paradigm for advancing the university's service offerings to stakeholders (e.g., students and staff) on the basis of mobile computing solutions and practices.

According to the types of stakeholders, the m-university services can be grouped into multiple major classes including student-oriented, employee-oriented, and faculty-oriented services. This categorization follows the one that has been considered for e-services by so many universities around the world. A generic view of these classes is articulated here as those enabled by the exploitation of mobile computing technologies (e.g., devices, networks, and applications) and trends in providing an enormous number of stakeholders with anywhere and anytime access to a broad range of university-related e-services.

A major development goal of these classes is to achieve an innovative provision of university services through relying on the most recent technologies that enable instant interactions between the university's stakeholders and its units and processes. Among these technologies, mobile devices and communication facilities have been widely noted as the foremost augmenters for such interactions. This importance mainly stems from the contemporary rapid developments in mobile technologies that have led to providing a variety of mobile value-added services (Calvo-Porrá & Otero-Prada, 2021) as well as overcoming many of the limitations that hinder the usage of these services, such as those related to the screen size, battery, memory, functionality, and bandwidth (Gao et al., 2008). For instance, today's hand-held devices (e.g., smartphones) are characterized by advanced digital

capabilities, including large-screen display, high storage capacity, and fast browsing (Zaidi et al., 2021). Also, this importance can be attributed to the ubiquitous feature of mobile technologies, which indicates that users are able to access the provided services easily at anytime from anywhere (i.e., having convenient access facilitated by the time-space flexibility) (Ma et al., 2021).

Although these classes have received significantly increased adoption in the higher education sector in the current decade, their assessment has been greatly overlooked in the e-services' research domain, especially in evaluating the factors that drive the stakeholders' continuance intention to use them and the determinants of their post-adoption perceived value. Various aspects of this research deficiency have been specifically pointed out in the context of new mobile services, such as the need to assess which factors contribute to users' intentions towards adopting these services (Koç et al., 2016). Assessing these factors is essential because they form the basis for developing the required strategies for implementing mobile services (Yamakawa et al., 2013). This need has been recently indicated in the domains of several instances of these services, such as those of m-learning (Qashou, 2021).

Consequently, research efforts undertaking such assessment facets empirically are highly required. This necessity is specifically manifest in the presence of the voluntary usage of these classes (i.e., there are no definite regulations enforcing users to adopt them). As a step to cope with this gap, the present study concentrates on addressing the roles of certain factors in promoting the individual's continuance usage intention and perceived value of such classes. These factors represent traits characterizing the m-university service and its users. Accordingly, an integrated research model has been developed by incorporating two categories of traits (i.e., m-university service and user ones) as direct antecedents of two anticipated post-adoption outcomes of these classes (i.e., continuance usage intention and perceived value).

The developed model comprises the main assumption of the information systems (IS) success theory (DeLone & McLean, 2003) by postulating the two categories of traits as substantial predictors of the success of these classes in attaining beneficial post-adoption outcomes. The category of m-university service traits includes reliability, usability, and customization. These traits are frequently highlighted in the IT adoption literature as quality dimensions of e-services (e.g., Bhat & Darzi, 2020; He et al., 2017; Kaur et al., 2020), and they have been highly demonstrated as crucial factors for predicting the usage of such services and behavioral intention towards them (e.g., Al-Hajri et al., 2021; Guzzo et al., 2016; Pillai et al., 2020). The user traits category contains self-efficacy and involvement, which represent essential attributes for signifying the quality of users' interactions with m-university services. However, the roles of each trait in these two categories in realizing post-adoption outcomes have not been widely studied in the e-services context, and therefore a critical lack of understanding of these roles is greatly observed in such an IT innovation adoption environment. As a consequence, the originality of this study has been asserted by investigating these roles in the domain of one of the most recent IT innovations, which is m-university services.

To evaluate these roles, the present study has considered the m-university services' class directed to the academic staff (i.e., faculty-oriented services). This class did not receive any considerable attention in the prior evaluation studies of m-university services, indicating a significant shortage of awareness about the predictors that shape its adoption and anticipated benefits. This affirms the general need to assess the factors influencing the adoption of mobile services in specific contexts (El Said, 2018), as well as to explore which of them are having significant roles in the attainment of post-adoption outcomes. Thus, undertaking such exploration in the domain of faculty-oriented m-university services is another distinction of this study. In this sense, it has been generally noted that the evaluation of the university e-services through the lens of the teaching staff has not been given a considerable focus in the prior studies concerning IT innovation adoptions in the higher education domain. Most of these studies concentrated on students' perspectives for assessing such services.

The validation of the developed model has been accomplished in the Saudi context, which has witnessed widespread adoption of a broad range of m-services by diverse sectors over the past few years. The most common examples of these services include those provided by the Ministry of Interior (e.g., issuing and renewing the Saudi passport), Ministry of Health (e.g., managing patient appointments), Ministry of Hajj and Umrah (e.g., issuing of entry permits to the Two Holy Mosques), and Saudi Data and Artificial Intelligence Authority (e.g., providing evidence for the health status of individuals). Such wide adoption can be attributed to several factors, including the increasing usage rates of mobile technologies in Saudi Arabia. In this regard, Alharbi et al. (2022) included an estimation indicating the existence of over 40 million mobile-cellular subscriptions in Saudi Arabia, with 95 percent of them having internet access.

In this context, a wide variety of academic and administrative m-services have been actively implemented in the higher education sector, thereby representing an adequate environment for testing the postulated associations between the model's constructs. In this sector, the model has been validated by taking into account an extensive implementation of m-university services by a large public university, which is Prince Sattam bin Abdulaziz University (PSAU; <https://www.psau.edu.sa/en>). PSAU provides its key stakeholders (i.e., students, employees, and academic staff) with a broad set of services and systems that can be collectively accessed through mobile technologies. Some instances of these include academic services, e-learning portal, transactions follow-up system, library services, self-services, graduation projects system, scientific research system, administrative services, IT services, documents management system, training services, communication system, and performance evaluation service.

In summary, the aforementioned description elucidates that the focus of the present study is on addressing the following research question: What are the roles of m-university service and user traits in promoting the continuance usage intention and perceived value in the context of faculty-oriented m-university services?. Exploring these roles empirically provides new insights and clarifications about the driving forces that lead to significant beneficial post-adoption outcomes of m-university services. Consequently, it contributes to enriching the extant mobile services literature as well as supporting the development of the adoption policies and implementation practices of these services.

THEORETICAL UNDERPINNING AND HYPOTHESES DEVELOPMENT

This section provides a theoretical background to the m-university service and user traits that have been examined in this study. Also, it presents the postulated associations between these traits and the two post-adoption desired outcomes (i.e., continuance usage intention and perceived value) as well as the empirical findings of some prior studies that addressed such associations. According to our review of the IT/IS adoption literature, there is only a limited number of these studies and all of them were conducted in other domains than the m-university services context. However, highlighting the findings of some of these studies is necessary to get a broader view of the impacts of these traits. The hypothesized associations are depicted in Figure 1 (at the end of the next major section), which represents the research model of the present study. The information systems theory that underpins these associations (i.e., IS success theory) is outlined next.

INFORMATION SYSTEMS (IS) SUCCESS THEORY

The well-known IS success theory was firstly introduced by DeLone and McLean in 1992 and updated later by them in DeLone and McLean (2003). Since its introduction, it has been extensively used to assess the success of diverse types of information systems. As such, it is characterized as the most prominent theory for measuring IS success (Mardiana et al., 2015). It encompasses six predictors of IS success that can be classified, according to the theory's model, as quality dimensions (i.e., system quality, information quality, and service quality), intermediate success constructs (i.e., use and

user satisfaction), and final success construct, which is called net benefits. It hypothesizes direct connections between the three quality dimensions and the intermediate constructs, which in turn are posited as having direct associations with the net benefits construct (DeLone & McLean, 2003). This construct is identified as the degree of IS contribution to the success of various entities (e.g., individuals and organizations), and assessed in terms of realizing a variety of gains, such as costs reduction, productivity enhancement, and profits improvement (Petter et al., 2013). Both the intermediate constructs and net benefits represent measures for assessing the effectiveness and success of an IS (Mardiana et al., 2015).

The developed model encompasses the main notion of the IS success theory by positing certain factors as significant contributors to the success of m-university services in achieving post-adoption benefits. This postulation was accompanied by modifying the specifications of the IS success theory's constructs and the links among them as follows. First, the three quality dimensions identified by the theory (i.e., system quality, information quality, and service quality) were replaced in the developed model by certain m-university service and user traits. Three of these traits (i.e., those of the m-university services: reliability, usability, and customization) have been extensively recognized as quality dimensions of e-services. This is evident from the large number of research studies that included these traits as determinants of the e-services quality (e.g., Bhat & Darzi, 2020; Kaur et al., 2020; Kim et al., 2019). These traits, as well as those of the user (i.e., self-efficacy and involvement), were regarded here as success dimensions for implementing m-university services and driving post-implementation benefits. Second, the indirect associations postulated by the theory (i.e., between the quality dimensions and net benefits) were not considered in the developed model, indicating that the impacts of the mediators involved in these associations (i.e., use and satisfaction) are not a focus of the present study. Third, the use construct included in the theory was replaced by the continuance usage intention in the developed model. According to C. Liao (2015), this intention is defined here as the individual's willingness to use the m-university services in the future. Such intention is respected as one of the crucial long-term outcomes and indicators of IS success, and thus it is regarded widely as an ultimate dependent construct of interest (Hu et al., 2009). However, the theory's postulation pertaining to the use construct (i.e., it is directly affected by the quality dimensions) was retained for the continuance usage intention in the developed model. This retention was accomplished by positing a direct association between such intention and both the m-university service and user traits.

Lastly, the net benefits were explicitly reflected in the developed model as achieving the perceived value of m-university services. Such value was indicated in this study as improving multiple aspects of the performance of individual users, such as increasing the effectiveness and efficiency of their work, enhancing their productivity, and facilitating the accomplishment of the tasks assigned to them. This indication follows the generic operationalization of the perceived value of using technology-based services, as highlighted by C. Liao (2015). It is also consistent with studies that have evaluated the perceived value in terms of the expected benefits of using a specific technological innovation (e.g., Tankovic & Benazic, 2018). Moreover, it is relevant to the conceptualization of the perceived usefulness construct provided by Davis (1989).

In short, the exact specifications of the IS success theory were modified in the developed model to precisely fit the concentration of this study, which is assessing the direct effects of key traits of both technology (i.e., m-university services) and users on promoting certain post-adoption gains (i.e., motivating the continuance usage intention and increasing the individual's perceived value). One of the key reasons for adopting this theory here is that it can be used to explore a variety of factors that contribute to the realization of a wide range of net benefits of implementing IT innovations. Exploring such factors was identified as a necessary aspect that should receive additional research efforts (Al-Adwan et al., 2021).

M-UNIVERSITY SERVICE TRAITS

Reliability

Reliability is generally used as an attribute of any component of a technical system, such as hardware, software, and human. It is described broadly as “the ability of an item to perform a required function, under given environmental and operational conditions and for a stated period of time” (Rausand & Hoyland, 2003). In the e-services domain, reliability was given more specific definitions and clarifications by some studies. As an example, Pu et al. (2020) defined it as “the ability to process a transaction request promptly and be available 24 hours ...”. Papadomichelaki and Mentzas (2012) viewed it as a term that comprises correct technical functioning (i.e., in terms of availability and accessibility) and accuracy of the promises pertaining to the service delivery. In this sense, reliability can be indicated as a construct encompassing several desirable characteristics, such as high availability of the e-services system, quick response to the various requests without failures or interruptions, and accuracy of the responses (He et al., 2017; Pu et al., 2020). Hence, the present study considered measuring the degree to which these characteristics are perceived by the m-university service users.

Effects of reliability on continuance usage intention

By concentrating on the direct association between reliability and continuance usage intention, the results of Hu et al. (2009) suggested that reliability is one of the most important attributes of the service quality that significantly influences the continuance intention of eTax service. Conversely, Naidoo and Leonard (2007) included that reliability is not a strong influencer of the user continuance behavior towards a financial healthcare's e-service. With respect to the indirect impacts on continuance intention, Kim et al. (2019) pointed out a significant total impact of reliability on the users' intention to continue using m-health services. To evaluate this total impact, they considered satisfaction as a construct that mediates the relationship between reliability and continuance intention. The majority of the prior studies considered the effects of reliability on other relevant post-adoption outcomes that lead to continuance usage intention, especially satisfaction. For instance, a significant positive correlation between reliability and satisfaction was explored in various fields, such as telematics services (He et al., 2017) and mobile health (Kim et al., 2019). Therefore, reliability is anticipated to have a positive association with the continuance intention to use m-university services as follows:

H1a: Reliability has a significant positive role in promoting an individual's continuance usage intention of m-university services.

Effects of reliability on perceived value

Regarding the relationship between reliability and the achievement of the e-services' anticipated benefits (i.e., constitute the value or usefulness of such services), Pu et al. (2020) found that reliability is having a significant positive influence on the perceived usefulness in the context of mobile payment services. They measured this usefulness in terms of achieving multiple benefits, such as enabling easier handling of payments and quick performance of transactions. Bhat and Darzi (2020) observed another significant direct impact of reliability on the perceived usefulness in the e-retailing services area. Their findings indicated that reliability has the strongest effect amongst the e-service quality predictors on perceived usefulness, which was evaluated by achieving multiple desired gains (e.g., improvement of the purchase effectiveness and fast realization of shopping goals). Similar results were demonstrated by Kuo et al. (2009) for a construct integrating both customer service and system reliability in the area of mobile value-added services. They explored that such construct, as compared to the others, is most influential on perceived value (e.g., obtaining good services). Consequently, the following relationship is posited:

H1b: Reliability has a significant positive role in promoting an individual's perceived value of m-university services.

Usability

Usability is a comprehensive concept that can be applied to a variety of entities, such as systems, services, or products. It is relevant to many aspects, including regular ongoing use, realizing the effectiveness of new users (i.e., through learning), and enabling the entity's usage by people having a wide range of capabilities. Accordingly, usability is a more inclusive concept than that pertaining to ease of use (International Organization for Standardization, 2018). This inclusive feature was reflected in the software quality domain by thoroughly indicating usability as a concept comprising a set of certain software attributes that impact the effort devoted to its use and the user assessment of such usage (Zapata et al., 2015). Such attributes include understandability, learnability, operability, and attractiveness.

In the e-services area, due to the absence of a common definition, usability has received a variety of definitions and interpretations in prior studies. For instance, by focusing on the Electronic Customer Relationship Management (E-CRM) performance, Al-Momani and Noor (2009) indicated usability as "the degree to which a user can complete tasks effectively and efficiently". Furthermore, they included the concentration of usability on multiple aspects, such as ease of use, ease of learning, aesthetics, and user satisfaction. Alahmed (2018) adopted the aforementioned definition to identify the determinants of the government e-services quality and, moreover, included usability as the degree to which conducting a transaction can be free of effort. In light of these views, the present study concentrated on assessing the most common aspects of usability (i.e., simplicity of usage, ease of learning, and overall clear and free of effort interaction) from the perspective of the m-university service users.

Effects of usability on continuance usage intention

Only a limited number of studies were found focusing on the association between usability and continuance intention to use an IT/IS innovation. The key findings of some of these studies are presented next. In the e-services context, Guzzo et al. (2016) explored the positive impact of usability on the frequency of use of e-commerce. Z. Liao et al. (2021) rationalized usability as one of the crucial factors for satisfaction and continuance intention to use enterprise e-banking services. Considering the adoption of mobile applications, Yassierli et al. (2018) provided evidence for the important role of usability as a determinant of the users' continuance intention to use these applications. On the contrary, insignificant impacts of usability on continuance intention were noticed in a few domains, such as mobile health services (Kim et al., 2019). In sum, most of the prior studies highlighted the importance of usability as a necessary antecedent to ensure the users' continuance intention to adopt an IT/IS innovation. Accordingly, the following hypothesis is suggested:

H2a: Usability has a significant positive role in promoting an individual's continuance usage intention of m-university services.

Effects of usability on perceived value

Several prior studies showed a significant positive impact of usability on realizing the anticipated benefits of e-services. Among such studies, Tzavlopoulos et al. (2019) observed that usability of the e-commerce website services contributes positively to increasing the levels of perceived value, which was considered as an outcome of the linkage between what a consumer receives against what is given to get a service. In the same context, a direct correlation between usability and the perceived usefulness of e-commerce services (i.e., the benefits perceived by consumers) was pointed out by Guzzo et al. (2016). Consistent with these empirical findings, Tankovic and Benazic (2018) included increasing the usability of e-shopping websites as one of the aspects that should receive efforts to enhance the perceived value (e.g., time-saving) in an online shopping environment. In contrast, an insignificant association between usability and perceived value was reported in a few domains, such as online orders through mobile apps (Shah et al., 2020). According to the aforementioned studies that highlighted the role of usability as a vital predictor of gaining the desired benefits of an IT/IS innovation, the following hypothesis is formed:

H2b: Usability has a significant positive role in promoting an individual's perceived value of m-university services.

Customization

Customization is one of the factors that involves paying attention and care to the user's requirements and interests. It can be broadly described as the ability to change a product or service to better fit the needs or preferences of the user (Laudon & Traver, 2020). In the e-services context, customization has been given specific definitions in several studies. For example, focusing on telematics services, He et al. (2017) presented the description of customization as the extent to which the customer's individual preferences are met. In e-banking, Albashrawi (2021) conceptualized customization as the extent to which the present users are satisfied when mobile banking is altered to provide customized options on the basis of their wants. Following many such studies, customization is defined in the present study as the degree to which m-university services and their related content and features meet the needs and preferences of the individual users.

Effects of customization on continuance usage intention

There is a notable lack of empirical studies addressing the direct link between customization and continuance intention (Albashrawi, 2021). Consequently, the present study has the opportunity to deal with this shortage by examining such a direct link in the m-university context. This examination has also been driven by additional aspects, including the presumption that the benefits of customization (e.g., making services more convenient) will motivate the continuance usage intention. Furthermore, this examination has been motivated by the encountered positive impacts of customization on a relevant construct pertaining to IT/IS usage, which is the intention to use (e.g., Pillai et al., 2020). Hence, the following association is proposed:

H3a: Customization has a significant positive role in promoting an individual's continuance usage intention of m-university services.

Effects of customization on perceived value

Multiple post-adoption benefits of customization were generally identified in the literature on e-services, including making services more convenient and leading to greater perceived control (Kasiri et al., 2017). In addition, some customization positive outcomes were empirically explored, such as increasing user satisfaction (Considine & Cormican, 2017) and driving customer engagement (Islam et al., 2020). Focusing specifically on the perceived usefulness outcome, the results of some studies showed a significant positive link between customization and such outcome in various contexts, such as m-commerce services (Kalinic & Marinkovic, 2016). In this sense, Kalinic and Marinkovic (2016) indicated that the greatest usefulness is perceived by those individuals whose needs and values are met by the adopted e-services. Therefore, the following relationship is formulated:

H3b: Customization has a significant positive role in promoting an individual's perceived value of m-university services.

USER TRAITS

Self-efficacy

Self-efficacy can be described broadly as the degree to which an individual believes that he/she can successfully conduct a certain behavior. As such, it is related to the individual's confidence concerning his/her ability to perform a specific task (Daragmeh et al., 2021). The crucial determinants that contribute to building such confidence in the individual's capability include the individual's education, experience, and skills (Pantano & Di Pietro, 2012). Hence, this confidence is shaped by acquiring the needed knowledge and skills to accomplish a task independently.

By concentrating on e-services, self-efficacy was given certain indications and demonstrations according to the service offering's type. Among these indications, it was elucidated by Verkijika and De Wet

(2018) in e-government as the individual's evaluation of his/her ability to successfully use a technological tool to access a specific service. In another advanced offering, Marakarkandy et al. (2017) described self-efficacy as the extent to which persons believe that they have the proficiency to conduct internet banking. Building upon these indications and other encountered descriptions of the self-efficacy concept, it is defined in this study as the individual's belief that he/she has the necessary ability, qualifications, and skills to use the m-university services.

Effects of self-efficacy on continuance usage intention

These effects have received an increasing number of empirical investigations in recent research. The findings of most of these investigations highlighted the role of self-efficacy as a key driver of the continuance usage intention of diverse electronic services, including those related to cloud e-learning (L. Wang et al., 2019), learning management systems (Al-Adwan et al., 2022), and mobile shopping (Thakur, 2018). Therefore, it can be suggested that individuals having high confidence in their abilities to use the m-university services are more likely to have a continuance usage intention. Hence, the following hypothesis is formulated:

H4a: Self-efficacy has a significant positive role in promoting an individual's continuance usage intention of m-university services.

Effects of self-efficacy on perceived value

Self-efficacy was explored as a crucial determinant of achieving post-adoption benefits in a variety of e-service offering settings. For instance, focusing on mobile services, self-efficacy was demonstrated as having a significant link with the perceived value of mobile-based ridesharing applications (Zhu et al., 2017). Considering self-customization services, Yu et al. (2019) showed a significant positive impact of self-efficacy on perceived benefit, which was indicated as perceiving a set of gains, including a more effective offering of services that the user needs. Such positive impact was also found on the perceived usefulness (e.g., improving performance and productivity) of other service innovations, such as e-wallets (Daragmeh et al., 2021). In contrast, insignificant effects of self-efficacy on realizing post-adoption benefits were detected in some contexts, such as internet banking (Marakarkandy et al., 2017). Despite such contradiction, there is an indication that having a high self-efficacy for a certain technological solution leads to benefits like better performance (e.g., more work efficiency) (Liao, 2015). Taking into account this indication and the encountered positive impacts of self-efficacy on gaining the anticipated benefits, the following hypothesis is suggested:

H4b: Self-efficacy has a significant positive role in promoting an individual's perceived value of m-university services.

Involvement

User involvement is one of the traits that has been greatly overlooked in the studies addressing the realization of the continuance intention and promised post-adoption gains of the adopted IT/IS innovations. This lack is even evident with respect to empirically exploring the effects of user involvement on the adoption and acceptance of these innovations (Leso & Cortimiglia, 2021). In spite of this lack, user involvement is always anticipated to have a significant contribution to the successful implementation of such innovations. It is defined as "a subjective psychological state reflecting the importance and personal relevance that a user attaches to a given system" (Barki & Hartwick, 1994). As such, it is also viewed as the degree to which an individual believes that a system is having two characteristics, which are importance and personal relevance (Hartwick & Barki, 1994). This indicates that the involvement occurs when a system is considered by the individual to be both important and personally relevant.

This view of user involvement was adopted in several studies in the area of technological innovation usage. For instance, Shiau and Luo (2013) defined it as an individual perceived relevance of the weblogs on the basis of importance, need, and values. Likewise, this conceptualization has been

considered in the present study for the user involvement with m-university services (i.e., the belief concerning the importance and relevance of these services).

Effects of user involvement on continuance usage intention

Prior studies have produced empirical evidence revealing positive influences of user involvement on continuance usage intention and other relevant constructs that are widely regarded as antecedents of such intention (e.g., attitude towards and behavioral intention to use the adopted technology). For example, Shiau and Luo (2013) found user involvement as one of the strongest determinants of the user's continuance intention of blogs. A similar result was explored by Alalwan (2013) in the e-government context. He reported a positive impact of this construct on the citizens' continuance intention to use government 2.0 services. Leso and Cortimiglia (2021) pointed out a significant positive association between user involvement and behavioral intention to use an information system. Conversely, some studies did not find a significant direct impact of user involvement on the system's usage or even the behavioral intention to use it (e.g., Jackson et al., 1997). However, in light of the encountered positive associations between user involvement and continuance intention, it can be suggested that when end-users perceive the importance and relevance of m-university services to them, they will more likely continue using such services. Accordingly, the following hypothesis is posited:

H5a: User involvement has a significant positive role in promoting an individual's continuance usage intention of m-university services.

Effects of user involvement on perceived value

The role of user involvement as a predictor of realizing the anticipated benefits of the adopted IT/IS innovation was empirically demonstrated in diverse research contexts. Among these, Klobas and McGill (2010) pointed out a positive link between students' involvement and benefits obtained from the usage of learning management systems (e.g., enhancing effectiveness and productivity during learning). By concentrating generally on the adoption of information systems, Jackson et al. (1997) and Leso and Cortimiglia (2021) explored that user involvement, as an intrinsic aspect, is a strong determinant with respect to the perceived benefits of a system (e.g., improving the effectiveness and performance of individuals in their jobs). Such association was also found by Amoako-Gyampah (2007) in a specific context concerning the adoption of enterprise resource planning systems. Drawing upon these significant links, a great possibility that users perceive the benefits of m-university services is present when they believe that these services are having the characteristics of importance and personal relevance. Thus, the following relationship is proposed.

H5b: User involvement has a significant positive role in promoting an individual's perceived value of m-university services.

RESEARCH MODEL

Figure 1 represents the research model of this study and depicts the hypothesized associations.

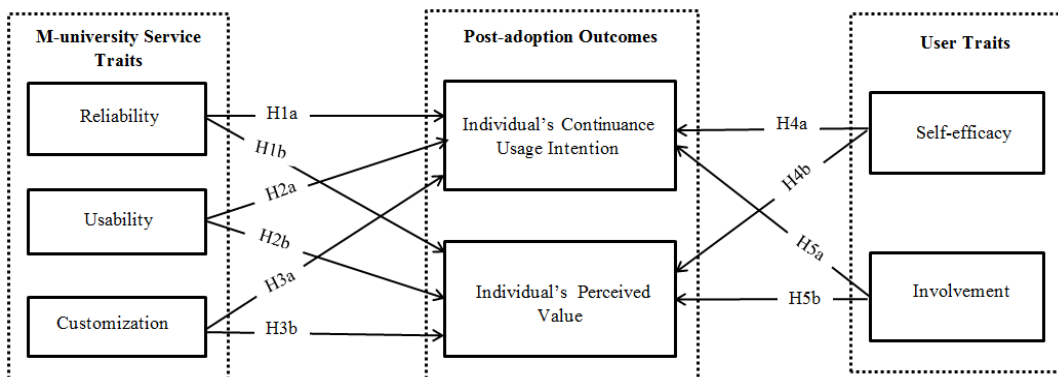


Figure 1. The postulated research model

RESEARCH METHODOLOGY

A quantitative research methodology was adopted in the present study to identify the m-university service and user traits that contribute to promoting the individual's continuance intention and perceived value of m-university services. The selection of such methodology stems from the nature of this study, which involved collecting and analyzing numerical data for the identification of these traits. Consequently, a closed-ended survey questionnaire was formulated as an instrument for data collection, and relevant statistical methods were employed to validate and analyze the gathered data. The questionnaire consisted of a cover letter explaining the goal of the study and guidelines for answering questions, a section for the demographic attributes (e.g., age, gender, and educational level), and three sections for the questions representing the measurement items of the m-university service traits, user traits, and dependent constructs, respectively. The questionnaire measurement items were all derived from the extant IT/IS adoption literature and were slightly modified to fit the research context of this study (i.e., m-university services). To ensure content validity, the questionnaire was reviewed by five experts in the research design and IT domains. Following their suggestions, some items were deleted and some were rephrased for better clarity and readability. The details of using the final items (i.e., their total is 22) to measure the model constructs, along with their sources, are given next.

MEASURING THE HYPOTHESIZED MODEL'S CONSTRUCTS

To measure the m-university service traits, three items were adapted from Pu et al. (2020) and He et al. (2017) to evaluate reliability. These items measure the perceptions about the availability, accuracy, and response of m-university services. Four items were extracted from Kim et al. (2019) and Kaur et al. (2020) to assess usability. These items represent the desirable usability attributes pertaining to ease of use, ease of learning, effective interaction, and data input with minimal time and effort. Three items measuring customization were adapted from Yeh and Li (2009) and He et al. (2017) to reflect the extent to which the individual's needs and preferences are met when using m-university services. To measure the user traits, self-efficacy was evaluated using three items that indicate the users' judgment of their confidence, qualifications, and skills to use m-university services. These items were adopted from Lallmahomed et al. (2017). Involvement was measured using three items from Hartwick and Barki (1994) and Shiao and Luo (2013). These items assess the importance, relevance, and necessity of m-university services to the users. Regarding the measures of the dependent constructs, three items evaluating the individual's perceived value were adapted from Liao (2015) and Rai et al. (2002) to assess the perceptions about benefits resulting from m-university services usage; namely, increasing work efficiency, improving productivity, and facilitating tasks accomplishment. The other dependent construct (i.e., continuance usage intention) was evaluated by three items adapted from Alruwaie et al. (2020) and Liao et al. (2009). These items measure the extent to which the user intends to use these services frequently and not discontinue using them or rely on alternative means in the future. The measurement items of all constructs (see Appendix) were assessed on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

DATA COLLECTION

The intended population of this study encompassed the academic staff of the considered Saudi public higher education institution (i.e., PSAU). These staff members are the only intended users of the faculty-oriented m-university services offered by PSAU, indicating that they are among the key stakeholders who can provide valuable inputs to the assessment process of the adoption of these services. Additionally, such participants are highly involved in teaching and research activities, and therefore they represent a reliable source for providing more credible responses and trustworthy feedback about the adopted survey's items. Convenience sampling, as a widely implemented sampling method, was used to choose a sample of participants from this population. This method comprises the selection of the most convenient individuals to serve as respondents (Robson & McCartan, 2016). The

questionnaire was self-administered to 320 respondents in this population. The total number of received responses was 223, indicating a response rate of 69.06%, out of which 207 fully completed responses were considered for analysis. The majority of the participants were male (89.9%), in the age group of 25–34 (42%), holding a PhD degree (49.3%), and having more than three years of experience in using mobile services (62.3%). The key characteristics of the considered responses are included in Table 1.

Table 1. The key characteristics of the considered responses (n=207)

Characteristic	Value	Number	Percentage
Gender	Male	186	89.9
	Female	21	10.1
Age range	Less than 25	9	4.3
	25-34	87	42
	35-44	73	35.3
	45–54	31	15
	Above 55	7	3.4
Educational level	Bachelor	29	14
	Master	76	36.7
	PhD	102	49.3
Duration of mobile services usage	Below 1 year	13	6.3
	1-3 years	65	31.4
	Above 3 years	129	62.3

COMMON METHOD BIAS DETECTION

Utilizing a single method for data gathering in this study involved assessing the Common Method Bias (CMB). The possibility of this bias mainly stems from relying on the same participants as the source to obtain data for both independent and dependent constructs in the same measurement context. A potential negative consequence of such bias is introducing significant measurement errors that impact the data analysis and findings of empirical research (Eichhorn, 2014; Podsakoff et al., 2003). To check the existence of this bias, Harman’s Single Factor (HSF), a widely used analytical technique for such assessment, was applied. According to Podsakoff et al. (2003), this test involved conducting an exploratory factor analysis that encompassed all the measurement items of the hypothesized model’s constructs to detect whether the majority of the total variance is explained by a single factor. This analysis was performed using the Statistical Package for the Social Sciences (SPSS). The findings indicated that seven factors accounted for 72.37% of the total variance in the examined data, whereas a single factor explained only 31.84% of such variance. Accordingly, no single factor was responsible for more than 50% (i.e., the cut-off value) of the total variance. This provides evidence that the CMB was not a significant concern in this study.

To confirm this result, a test considering a common latent factor was implemented using Analysis of a Moment Structures (AMOS) software. This test, as included in many prior studies (e.g., Chakraborty & Bhat, 2018; Shashi et al., 2019), imposed conducting a confirmatory factor analysis (CFA) to produce the standardized regression weights of a model containing only the seven examined constructs and an extended model that included an additional construct representing a common latent factor. The produced weights of the two models were further compared to find out the differences between them. The obtained differences were in the range of 0.135 to 0.191 for reliability, 0.035 to 0.187 for usability, 0.043 to 0.165 for customization, 0.086 to 0.101 for self-efficacy, 0.058 to 0.164 for involvement, 0.150 to 0.186 for individual’s perceived value, and 0.005 to 0.161 for continuance usage intention. As such, each of these differences was less than the threshold value of 0.2 (Chakraborty & Bhat, 2018), indicating that a significant difference was not detected between the

standardized weights of the two models. This confirms that the CMB was not a critical threat to the validity of the present study results.

In addition to testing for the existence of the common method bias, an examination for another phenomenon that affects the analysis conclusions (i.e., multicollinearity between the independent constructs) was also conducted. This phenomenon indicates that there are high correlations between two or more independent constructs. It was tested here by generating the values of a widely applied measure for examining such a phenomenon, which is the variance inflation factor (VIF). The obtained VIF values for all independent constructs in the developed model, ranging from 1.162 to 2.427, were below the cut-off value of 3.3 (Kock & Lynn, 2012), thereby multicollinearity was not an issue in the present study.

DATA ANALYSIS AND FINDINGS

The statistical techniques of the Structural Equation Model (SEM) approach, as used extensively in the IT/IS adoption area, were implemented to assess both the measurement model (i.e., the associations between the examined traits and their measurement items) and structural model (i.e., the effects of these traits on the continuance intention and perceived value). The importance of the SEM approach, as compared to the traditional statistical ones (e.g., correlation and regression), stems from its characterization as a flexible and comprehensive methodology for examining associations among a variety of variables (Suhr, 2006). It was applied in the present study using two powerful statistical tools, which are SPSS and AMOS software.

MEASUREMENT MODEL ASSESSMENT

The measurement model was evaluated on the basis of convergent validity, discriminant validity, and internal consistency. Convergent validity (i.e., the extent to which measurement items of a certain construct are correlated with each other) was assessed by inspecting three popular measures: (1) factor loadings of the measurement items, (2) average variance extracted (AVE), and (3) composite reliability. Factor analysis was applied to obtain the loadings of the adopted measurement items on their corresponding constructs. As a rule of thumb, the loading of each item should ideally be greater than or equal to 0.70 (Hair et al., 2019). The produced loading values (Table 2) indicate that all the items in the measurement model met this criterion. Therefore, these items were satisfactorily associated with their respective constructs. The obtained AVE values (ranging from 0.61 to 0.76) were computed based on the item loadings and the results (Table 2) show that the AVE value of each construct exceeded the cut-off value of 0.5 (Hair et al., 2019), which indicates an adequate convergence. The values of composite reliability for all constructs, ranging from 0.839 to 0.904 (Table 2), were above the recommended value of 0.7 (Fornell & Larcker, 1981), indicating acceptable reliability. Based on the values of these three measures (i.e., loading, AVE, and composite reliability), the measurement model had adequate convergent validity.

Discriminant validity (i.e., the extent to which the model's constructs are distinct from each other) was evaluated by considering the criterion that the square root of each construct's AVE should be greater than the construct's correlations with the other constructs (Fornell & Larcker, 1981). As shown in Table 3, the correlations between the model's constructs (i.e., the off-diagonal values) are less than the square roots of all the AVEs (i.e., represented on the diagonal). Accordingly, discriminant validity was confirmed for all constructs, which indicates sufficient distinction between them.

The internal consistency (i.e., the degree to which individual items in a questionnaire measure the same construct and produce consistent results (Echevarría-Guanilo et al., 2017) was evaluated using Cronbach's alpha (Cronbach, 1951), which is the most popular measure for such evaluation. Table 2 presents that the Cronbach's alpha values for all constructs (ranging from 0.713 to 0.842) exceeded the recommended minimum value of 0.70. Hence, an acceptable internal consistency was evident.

Table 2. Assessment results for the measurement model

Construct	Items	Loadings	Cronbach's Alpha	Composite Reliability	AVE
Reliability (R)	R1	0.824	0.812	0.889	0.73
	R2	0.921			
	R3	0.814			
Usability (U)	U1	0.846	0.775	0.859	0.61
	U2	0.780			
	U3	0.730			
	U4	0.753			
Customization (C)	C1	0.829	0.729	0.846	0.65
	C2	0.830			
	C3	0.755			
Self-efficacy (SE)	SE1	0.795	0.741	0.856	0.67
	SE2	0.879			
	SE3	0.771			
Involvement (I)	I1	0.869	0.842	0.904	0.76
	I2	0.849			
	I3	0.897			
Individual's Continuance Usage Intention (ICUI)	ICUI1	0.847	0.713	0.839	0.64
	ICUI2	0.718			
	ICUI3	0.823			
Individual's Perceived Value (IPV)	IPV1	0.798	0.808	0.887	0.72
	IPV2	0.878			
	IPV3	0.872			

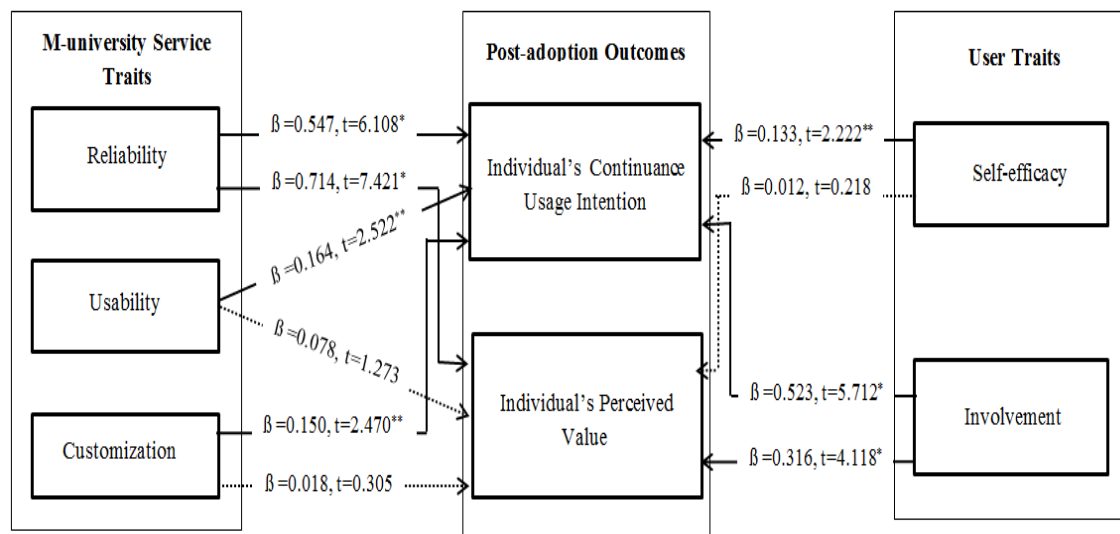
Table 3. Discriminant validity assessment results

	R	U	C	SE	I	ICUI	IPV
Reliability (R)	0.854						
Usability (U)	0.642	0.781					
Customization (C)	0.666	0.584	0.806				
Self-efficacy (SE)	0.362	0.263	0.271	0.818			
Involvement (I)	0.397	0.357	0.214	0.215	0.871		
Individual's Continuance Usage Intention (ICUI)	0.533	0.541	0.394	0.327	0.650	0.800	
Individual's Perceived Value (IPV)	0.540	0.529	0.371	0.258	0.538	0.778	0.848

Note: The off-diagonal values are the correlations among the constructs, while the values on the diagonal are the square roots of AVEs.
 * All correlations are significant at $p < 0.01$

STRUCTURAL MODEL ASSESSMENT

The evaluation of the structural model involved examining the postulated model's fit to the sample data and the hypothesized associations between its constructs. To examine the model fit, a group of



* Significant at $p < 0.001$, ** Significant at $p < 0.05$, dotted lines indicate insignificant paths

Figure 2. Hypothesized associations testing results

DISCUSSION

The target of this study was to investigate the roles of key m-university services and user traits (i.e., reliability, usability, customization, self-efficacy, and involvement) as antecedents of the individual's continuance usage intention and perceived value of m-university services. The empirical results showed that all of the examined traits are having positive roles in promoting the continuance intention to use these services, while only two traits (i.e., reliability and involvement) contribute significantly to augmenting the individual's perceived value. Accordingly, the users will have a continuance usage intention if they realize the three traits of the m-university service and are having confidence and involvement towards these services at the adoption stage, whereas they will only perceive the value of such services when the reliability and involvement are guaranteed.

The obtained positive effects on the continuance usage intention are consistent with those found in prior studies for reliability (e.g., Hu et al., 2009), usability (e.g., Yassierli et al., 2018), self-efficacy (e.g., Daragmeh et al., 2021), and involvement (e.g., Shiao & Luo, 2013). Regarding the impacts on the individual's perceived value, the results confirmed the outcome of Bauer et al. (2006) that reliability is among the strongest factors that determine the customer's perceived value. Moreover, they explored reliability as the most powerful driver of all dependent constructs (i.e., as in our case). With respect to the user involvement effect on the perceived value, the finding is in the same line with Amoako-Gyampah (2007) who explored this construct as having the second strongest effect on such value.

The importance of these traits with respect to their influences on the dependent constructs (i.e., the two anticipated post-adoption outcomes) was determined based on the values of the obtained standardized path coefficients (i.e., presented in Table 5). These coefficients indicate that reliability ($\beta=0.547$) is the most important factor (i.e., having the strongest influence) impacting the continuance usage intention, followed by involvement ($\beta=0.523$), usability ($\beta=0.164$), customization ($\beta=0.150$), and self-efficacy ($\beta=0.133$), respectively. Concerning the impacts on the individual's perceived value, reliability ($\beta=0.714$) is also possessing the strongest effect, as compared to involvement ($\beta=0.316$). In sum, among all the examined m-university service and user traits, reliability has the greatest influence on the two dependent constructs.

This emphasizes the roles of the m-university service's reliability in driving post-adoption benefits, including enhancing the job performance and productivity of individuals as well as promoting their continuance intention to use these services. Accordingly, mobile service providers should focus on the continued improvement of the reliability dimensions (e.g., service availability and requests satisfaction accuracy) in order to ensure the realization of such gains and subsequently increase the end user's satisfaction and retention.

The second crucial trait that predicts the two dependent variables is a user's one, which is involvement. This trait was substantially overlooked in the IT/IS literature in examining its effects on both adoption and driving post-adoption gains of technological innovations. As a step to deal with this literature's shortage, the present study assessed such effects on promoting two post-adoption outcomes (i.e., continuance usage intention and perceived value). The findings demonstrated the benefit and merit of this trait, as compared to other ones (i.e., self-efficacy, usability, and customization), in improving the aspects of these outcomes (e.g., the frequent usage of m-university services). In this sense, Shiau and Luo (2013) included that achieving the anticipated benefits from the adopted technology requires its effective usage. Such usage is driven by several key factors, including user involvement. Consequently, the policy makers involved in the development of mobile services are required to focus on enhancing the facets of improving the users' interaction with these services in order to boost their feelings towards the importance and relevance of such technology to them, and accordingly ensure high user involvement that leads to realizing post-adoption gains (e.g., increasing the acceptability/usage of these services as well as their value). Such enhancement includes specifying high standards for interface design, user request satisfaction, and effective business rules implementation.

Unexpectedly, the findings demonstrated insignificant effects of two m-university service traits (i.e., usability and customization) and one user trait (i.e., self-efficacy) on the individual's perceived value. As such, in the context of this study (i.e., m-university services), these three traits could not act as direct drivers that contribute to achieving the individual's anticipated benefits of these services. The probable reasons behind this result include the following.

First, the three traits can act only as determinants for m-university services adoption and continuance usage intention, indicating that they have no contribution to realizing the prospective benefits of these services in the post-adoption phase. Several studies confirmed this possibility by demonstrating the insignificance of one or more of these traits in the post-adoption stage. For instance, C. Wang (2014) and Shah et al. (2020) showed an insignificant influence of perceived ease of use (i.e., usability aspect) on perceived value in the context of mobile services. In addition, C. Wang (2014) included that this usability aspect is not as important in the post-adoption stage as in the pre-adoption one. Also, this possibility was realized for self-efficacy in the studies that observed an insignificant association between this construct and realizing post-adoption benefits, such as Marakarkandy et al. (2017). One indication of such observation is that self-efficacy can only be related to usability and does not contribute to achieving the anticipated gains of some adopted IT innovations. Second, the possibility of having unanticipated variables that mediate the influences of these traits on the perceived value, indicates that indirect associations could exist for such influences. Such indirect associations are found in several recent studies, including Cheng (2020).

In light of these insignificant associations, the key stakeholders of the university (e.g., the managers), as well as the m-university services providers need to set effective design specifications that strengthen the contributions of the three traits towards realizing post-adoption benefits of these services. These specifications should augment the crucial aspects of the three traits, including the ease of m-university services use, provision of the features that the user likes, service adaptability, user's confidence towards the service regardless of their diverse qualifications and skills, and meeting the overall user's expectations. Notably, such aspects drive the optimum service usage that leads to raising the anticipated value of these services.

CONCLUSION

This study intended to empirically explore the direct effects of crucial m-university services and user traits on promoting key anticipated post-adoption outcomes of m-university services (i.e., continuance usage intention and perceived value). The category of m-university service traits includes three quality dimensions of e-services (i.e., reliability, usability, and customization), while the user traits category contains two essential attributes that signify the quality of users' interactions with the m-university services, which are self-efficacy and involvement. To achieve the study purpose, an integrated model encompassing the influences of these traits on the two post-adoption outcomes was developed and justified on the basis of existing IT/IS adoption and continuance theories, and afterward it was validated and evaluated using the structural equation modeling framework. The findings demonstrated that each of the assessed traits is having a positive significant role in motivating the continuance usage intention, while only two traits (i.e., service reliability and user involvement) contribute positively to the perceived value. Thus, the significant determinants of both post-adoption outcomes included only one trait from each category (i.e., m-university service and user traits).

The contributions that shape the uniqueness of this study are highlighted as follows. First, the study examined effects that were greatly overlooked in prior research, such as the impacts of service reliability, customization, and user involvement on promoting the two post-adoption outcomes. Second, the examination of these effects was carried out in the context of an IT innovation that was not received considerable attention in the extant IT/IS literature (i.e., m-university services), indicating the scarcity of studies looking at the predictors that drive the success and value of such services. Therefore, to the best of our knowledge, this is the first study that gains the chance to provide the research community and m-service providers with new knowledge and understanding about these effects in the m-university services area. Lastly, most of the prior studies in other contexts focused on examining these effects on only one post-adoption outcome, with a great focus given to the continuance usage intention. This signifies the absence of sufficient knowledge about the predictors of the other outcomes (e.g., perceived value). Accordingly, the findings of this study provide both researchers and practitioners in the IT/IS innovation area with new empirical insights and clarifications concerning the drivers of such outcomes.

The study has several limitations that can be taken into account in future research work in the m-university services context. Some of these limitations can be acknowledged as follows. First, the examination of the effects of a limited number of m-university service and user traits (i.e., five) on only two post-adoption outcomes, indicates that further studies are needed to encompass more of such constructs in their models and examine new diverse associations between them. This contributes to extending the extant IT/IS adoption and success theories by exploring new predictors and causal relationships. Second, the scope of the study was constrained to examine the postulated model in only one university, thereby the possibility of generalizing the obtained outcomes is notably limited. Hence, there is a necessity to validate the findings of this study in upcoming research efforts that consider successful m-university service implementations in a plausible number of higher education intuitions. Finally, the assessment of the roles of the m-university service and user traits was done from the perspective of only one set of university stakeholders (i.e., academic staff), suggesting the need to pay attention to the opinions and views of other sets (e.g., students) in future work.

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APPENDIX

Measurement Items

Reliability (R)
R1: M-university services are available whenever I need them
R2: M-university services respond to my requests accurately
R3: M-university services respond quickly to my requests without failures
Usability (U)
U1: M-university services are easy to learn
U2: M-university services are easy to use
U3: My interaction with the m-university services is clear and understandable
U4: M-university services require data input with minimal time and effort

Customization (C)
C1: I feel that using the m-university services meets my needs C2: M-university services provide me with relevant information according to my preferences C3: M-university services have features that meet my desires
Self-efficacy (SE)
SE1: I am confident in my ability to use the m-university services SE2: I have the necessary skills to use the m-university services SE3: I have the necessary qualifications to use the m-university services
Involvement (I)
To me, m-university services are I1: Important I2: Relevant I3: Needed
Individual's Continuance Usage Intention (ICUI)
ICUI1: I intend to continue using the m-university services in the future ICUI2: I will frequently use the m-university services in the future ICUI3: My intentions are to continue using the m-university services than use any alternative means
Individual's Perceived Value (IPV)
Using the m-university services.... IPV1: increases the operational efficiency of my work IPV2: increases my productivity IPV3: helps me to easily accomplish my work

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