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CONTINUOUS USE OF MOBILE BANKING APPLICATIONS: THE ROLE OF PROCESS VIRTUALIZABILITY, ANTHROPOMORPHISM AND VIRTUAL PROCESS FAILURE RISK

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ABSTRACT

Aim/Purpose	The research aims to investigate the factors that influence the continuous use of mobile banking applications to complete banking monetary transactions.
Background	Despite a significant increase in the use of mobile banking applications, particularly during the COVID-19 pandemic, new evidence indicates that the use rate of mobile banking applications for operating banking monetary transactions has declined.
Methodology	The study proposed an integrated model based mainly on the process virtualization theory (PVT) with other novel factors such as mobile banking application anthropomorphism and virtual process failure risk. The study model was empirically validated using structural equation modeling analysis on quantitative data from 484 mobile banking application users from Jordan.
Contribution	The study focuses on continuing use or post-adoption behavior rather than pre-adoption behavior. This is important since the maximum and long-term viability, as well as the financial investment in mobile banking applications, depend on regular usage rather than first-time use or initial experience.

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Findings	The results indicate that process virtualizable and anthropomorphism have a strong positive impact on bank customers' decisions to continue using mobile banking applications to complete banking monetary transactions. Meanwhile, the negative impact of virtualization process failure risk on continuous use has been discovered. The found factors explain 67.5% of the variance in continuous use.
Recommendations for Practitioners	The study identified novel, significant factors that affect bank customers' decisions to use mobile banking applications frequently, and these factors should be examined, matched, satisfied, or addressed when redesigning or upgrading mobile applications. Banks should provide users with clear directions, processes, or tutorials on how to complete monetary transactions effectively. They should also embrace Artificial Intelligence (AI) technology to improve their applications and products with anthropomorphic features like speech synthesizers, Chatbots, and AI-powered virtual bank assistants. This is expected to help bank customers conduct various banking services conveniently and securely, just as if interacting with real people. The study further recommends that banks create and publish clear norms and procedures, as well as promote tolerance and protect consumers' rights when the process fails or mistakes occur.
Recommendations for Researchers	The study provides measurement items that were specifically built for the context of mobile banking applications based on PVT notions. Researchers are invited to reuse, test, and modify existing measurement items, as well as submit new ones if necessary. The study model does not consider psychological aspects like trust and satisfaction, which would provide additional insight into factors affecting continuing use. Researchers could potentially take a different approach by focusing on user resistance and non-adoption.
Impact on Society	Financial inclusion is problematic, particularly in underdeveloped nations. According to financial inclusion research, Jordanians rarely utilize mobile banking apps. Continuous usage of mobile banking applications will be extremely beneficial in closing the financial inclusion gap, particularly among women. Furthermore, it could help the country's efforts to transition to a digital society.
Future Research	The majority of study participants are from urban areas. Future studies should focus on consumers who live in rural areas. It was also suggested that the elderly be targeted because they may have different views/perspectives on the continued use of mobile banking applications.

Keywords	mobile banking applications, continuous use, process virtualization theory, post-adoption

INTRODUCTION

The outbreak of the COVID-19 pandemic has greatly increased the use of mobile banking applications (Alsmadi et al., 2022; Lightico, 2020). A recent survey has shown that American bank customers have used mobile banking applications much more during the pandemic than during pre-pandemic times (Chase, 2021). In the context of developing countries – which usually record lower use rates when it comes to an innovation or service such as mobile banking applications (Baabdullah et al., 2019; Souiden et al., 2021) – recent studies have found a positive change in users' attitudes conjugated with an increase in the actual use of mobile banking applications during the pandemic, albeit it was slight (Kamdjoug et al., 2021; Nair et al., 2021; Rafdinal & Senalasari, 2021).

However, during the COVID-19 pandemic, with frequent lockdowns, many users who used/experienced mobile banking applications might have been in a compulsory situation where they had no choice but to use digital channels. As lockdowns have been relaxed or ended, and all sectors, including banks, have reopened, customers can now decide whether to continue using mobile banking applications. Accordingly, there is a possibility that they would back off from using mobile banking applications and return to performing banking transactions at the banks' physical sites/branches instead of online.

A new Global Banking Consumer Study by Accenture stated that the majority of 49,000 bank customers across generations still value branches, which they use for specific, important transactions (Abbott et al., 2023). This refers to the fact that the individual's attitudes and behavior toward using technology are not constant; instead, it is dynamic and continually changing over time, as earlier suggested by Bhattacherjee and Premkumar (2004). New research has examined this assumption by extending Bhattacherjee and Premkumar's model and confirmed that individuals' attitudes and beliefs are likely to change over time as they develop experiences with technology (Xu et al., 2017). While it could be argued individuals' attitudes and beliefs may determine the initial adoption phase of technology, the continuous use phase is more associated with user experience and the value obtained from the use of technology, which in turn would reshape their attitudes and beliefs of using such technology (Venkatesh et al., 2016; Xu et al., 2017). Further, the initial use does not necessarily mean or warrant continuous use, as earlier supposed (Bhattacherjee, 2001; Limayem & Cheung, 2008). The information system/information technology (IS/IT) literature supports the assumption that the initial use of specific IS/IT does not always guarantee long-term use or enduring utilization or success (Franque et al., 2020; Venkatesh et al., 2011; Yan et al., 2021). Hence, a central question arises:

> *What are the factors that influence bank customers' decision to continue using mobile banking applications?*

To answer the research question, the present research stands on the rational assumption that the continuous use of mobile banking applications depends on the capability of the application (technology) to provide users with a virtual environment for executing banking transactions or services similar/equivalent to that face-to-face environment which occurs at the bank's physical sites. A novel IS theory fits very well in scrutinizing this assumption; the theory is called the Process Virtualization Theory (PVT), and it was given by Overby (2008, 2012). The PVT originally examines the amenability of a process that can be readily migrated from the physical environment and conducted virtually. The PVT posits that when the requirements of a physical process are being suitably satisfied (or being properly simulated) by IT/IS (e.g., website or mobile application), such process will be more amenable to be conducted virtually; therefore, the users would be more inclined to use/continue using that system or technology (Overby, 2008, 2012). The current study proposes a research model based on PVT. It has integrated it with other important related factors – the anthropomorphism of the mobile banking application and the virtual process failure risk. The PVT and research model are further explained in the research framework section.

The contributions of this study are worth highlighting. The study heeds several calls to investigate the continuous use or post-adoption behavior of mobile banking applications, to explore other theories that could enrich the knowledge in the mobile banking domain, and add to other traditional IS/IT adoption theories and models (Carlos & Oliveira, 2017; Souiden et al., 2021; Susanto et al., 2016). Some researchers went further and raised serious doubts regarding the overutilization of IS/IT adoption theories and models as it may result in producing studies that are, to a large extent, similar in content (Souiden et al., 2021). Against this background, the use of PVT as a different theoretical stance theory truly diversifies and enriches mobile banking literature. The research also has practical significance for banks' administrations, which are going to recognize a new set of significant factors that would shape bank customers' decisions to continued use of mobile banking applications; they would, therefore, design their mobile applications to match/satisfy/address the influencing factors. Accordingly, banks can serve customers in the best possible manner and boost their loyalty, thereby

acquiring more customers, enlarging market share, and ultimately, strengthening the bank's competitive position (Horani et al., 2023).

The remainder of this paper is presented in the following sequence. The next section briefly introduces the mobile banking concept, benefits, and challenges. The literature review section is divided into two subsections. The first section presents some previous literature review studies on mobile banking acceptance and adoption, and the second section discusses in detail a review of recent research on mobile banking's continuous use or post-adoption and identifies some prominent research gaps. The research framework section introduces the PVT as the guiding theory of the research, discusses the development of the conceptual model, and proposes related hypotheses. The applied research methodology and the research findings are next discussed, followed by the discussion of the results and associated implications for both practitioners and researchers. Finally, the conclusions drawn from this study are presented, followed by a discussion of the limitations and suggestions for future research.

BACKGROUND

The banking industry is one of the earliest sectors to recognize the power of using IS/IT (Liao & Cheung, 2002). Starting from using automated teller machines (ATMs) in the late 1970s to the use of the telephone (speech banking), then the use of the Internet for banking transactions in the mid-1990s, banks have almost not missed any opportunity provided by disruptive technologies to revolutionize their entire banking business processes (Alalwan et al., 2017; Gu et al., 2009; Sanader, 2014). The IS/IT has allowed banks to expand their operations and adjust their services, placing them through new communication channels (Sanader, 2014). Due to the upsurge penetration of smartphones and the rapid advances of mobile technologies, banks worldwide have early started to employ smartphones as a new platform and digital means to interact with customers, which refers to mobile banking (Barnes & Corbitt, 2003; Gu et al., 2009; Mallat et al., 2004).

Mobile banking is a new practice or channel of conducting self-banking transactions enabled by mobile phone platforms, whereby the customers can access their banks and conduct miscellaneous and variety of banking transactions virtually or remotely at any time and any place regardless of the bank's operating or working hours (Barnes & Corbitt, 2003; Mallat et al., 2004). Such transactions range from monetary/financial transactions, e.g., transferring funds, paying bills, peer-to-peer payments, and remittance, and nonmonetary/nonfinancial transactions, to opening up a new banking account, balance inquiries, applying for credit cards, personal identification number change, ordering checks, reviewing transactions, information on credit cards, locations of branch offices and ATMs, and reporting a change of personal information such as change of mobile phone or an address (Tomić & Stojanović, 2018).

Mobile banking comes with many benefits that could be delivered to customers, i.e., immediacy and availability of services 24/7, affordable and convenient, reduced time and access barriers to banking services, and proactive functionalities that ultimately enhance customer service experience (Chandran, 2014; Tomić & Stojanović, 2018). Although the benefits of mobile banking are widely recognized, it also poses various challenges, mainly security and privacy concerns, perceived risk, and lack of trust (Baptista & Oliveira, 2016; Drigă & Isac, 2014; Sultan et al., 2023; Sundararaj, 2022).

Mobile banking is expected to become one of the primary and most favorable channels for customers to interact with banks and perform various banking transactions (Baptista & Oliveira, 2016; Drigă & Isac, 2014). Without a doubt, the use of mobile banking applications is skyrocketing. Nevertheless, a recent global banking consumer study in 2023 by Accenture has reported that bank consumers still value physical bank branches (Abbott et al., 2023). As per the survey, most respondents (around two-thirds of 49,000 bank consumers worldwide use their bank's digital channels for quick tasks such as simply checking their account balances. According to Accenture's study, 63% of bank consumers turn to branches to solve specific and complicated problems.

LITERATURE REVIEW

Due to the entanglement of mobile banking acceptance, adoption, and continuous use (or post-adoption) research, this section does not intend to provide a comprehensive review of previous studies that dealt with the acceptance and adoption theme, which is out than the current study scope aim. Rather, it will highlight some general remarks that emerged from previous prominent literature review studies on mobile banking acceptance and adoption. Then, the section provides a detailed review of available literature examining only the continuous use (or post-adoption) of mobile banking applications.

THE ACCEPTANCE AND ADOPTION OF MOBILE BANKING APPLICATIONS

Several previous prominent literature review studies provide a clear picture of the 'state-of-the-art' of mobile banking acceptance and adoption (e.g., Baptista & Oliveira, 2016; Carlos & Oliveira, 2017; Hoehle et al., 2012; Shaikh & Karjaluoto, 2015; Souiden et al., 2021). A careful exploration of those review studies has exposed some general remarks.

First, the traditional adoption of IS/IT models is dominant in mobile banking acceptance and adoption studies. The majority of the previous studies have used a variety of traditional IS/IT acceptance and adoption theories/models to guide investigations, specifically Davis' (1989) technology acceptance model (TAM) (e.g., Farah et al., 2018), Venkatesh et al.'s (2003) unified theory of acceptance and use of technology (UTAUT), for example (Merhi et al., 2019; Purwanto & Loisa, 2020; Ukpabi et al., 2018), and Venkatesh et al.'s (2012) extension UTAUT 2, for example (Gharaibeh & Arshad, 2018). Some other theories were often found as the most-used theories, namely DeLone and McLean's (2003) model (D&M) of IS success (e.g., Rofi'i et al., 2023; Tam & Oliveira, 2016) and Bhattacherjee's (2001) expectation confirmation model (ECM) (e.g., Adjei et al., 2020; Rabaa'i & AlMaati, 2021; Rahi et al., 2021; Vedadi & Warkentin, 2016).

Second, the IS/IT acceptance and adoption theories/models were used either solely or in combination with each other or with other theories. They also have been extended with other factors related to the mobile banking context, e.g., perceived risk, trust, perceived enjoyment, security, and privacy (e.g., Baptista & Oliveira, 2016; Carlos & Oliveira, 2017; Farah et al., 2018; Giovanis et al., 2019; Mansour, 2020; Merhi et al., 2019; Rahi et al., 2021; Sharma & Sharma, 2019).

Third, repeatedly investigate and indicate similar influencing factors of the acceptance and adoption of mobile banking, specifically, perceived ease of use, perceived usefulness, user attitude, and social norms. Other factors have also been identified, such as, but not limited to, perceived risk, enjoyment, privacy and security concerns, trust in technology, facilitating conditions, and perceived creditability (Merhi et al., 2019; Patel & Patel, 2018).

THE CONTINUOUS USE OR POST-ADOPTION OF MOBILE BANKING APPLICATIONS

This section aims to provide a comprehensive review of the most related literature on the continuous use (or post-adoption) of mobile banking applications. Generally, several previous mobile banking studies have reported that the continuance use of mobiles has been widely overlooked in mobile banking literature (Asnakew, 2020; Carlos & Oliveira, 2017; Oertzen & Odekerken-Schröder, 2019; Rabaa'i & AlMaati, 2021; Souiden et al., 2021). Nevertheless, we have recently witnessed a growing interest and a surge in research efforts aimed at understanding the continuance use of mobile banking. In the following section, we provide a detailed discussion of recent studies.

A recent study investigated the factors that influence the continuance usage intention of mobile banking (Inan et al., 2023). The study's theoretical model was based on quality service and self-determination theory. The results indicated that service quality positively influences satisfaction; in turn, satisfaction and perceived usefulness significantly impact the continuance usage of mobile banking. Drawn upon integrating three IS/IT theories, the Theory of Planned Behavior, UTAUT,

and TAM, recent research examined the continued intention to use mobile banking (Abu-Taieh et al., 2022). The study results indicated that effort expectancy, performance expectancy, perceived risk, perceived trust, and social influence had determined the users' behavioral intention and then impacted their continuous use of mobile banking. Previous research uses UTAUT to identify the antecedents of mobile banking services' continuous usage in a developing market context (Ukpabi et al., 2018). The study established that facilitating conditions, social influence, and users' privacy concerns are critical antecedents underlying mobile banking's continuous usage.

Recent research has extended ECM and found a significant influence of perceived trust, satisfaction, self-efficacy, performance expectancy, and effort expectancy on bank customers' continuous use of mobile banking services (Rabaa'i & AlMaati, 2021). An earlier study by Susanto et al. (2016) has extended ECM and found that perceived usefulness, satisfaction, and self-efficacy have a direct positive influence on continuance use intention. Another study has integrated ECM, TAM, and Task-Technology Fit models and found that satisfaction, perceived usefulness, perceived task-technology fit, and perceived risk were important drivers of continuance intention (Yuan et al., 2016).

The results revealed from Naruetharadhol et al.'s (2021) study demonstrated that self-service technology dimensions (functionality, enjoyment, assurance, convenience, security, design, and customization) positively influence perceived use and perceived usefulness (prominent constructs of TAM), which in turn positively enhanced mobile banking users intention to sustained adopting mobile banking services. Another study reported that attitude, trust, perceived ease of use, and perceived usefulness (prominent constructs of TAM) significantly influence continuance intention to use mobile banking (Asnakew, 2020). Foroughi et al.'s (2019) study extended the technology continuance theory and confirmed the influence of perceived usefulness, satisfaction, and self-efficacy on the intention of mobile banking continuance.

Similar to what has been observed from mobile banking acceptance and adoption studies, our literature review revealed that previous studies on the continuous use of mobile banking often use or extend traditional IS/IT acceptance and adoption theories/models to investigate the continuous use of mobile banking applications, specifically, ECM, TAM, and UTAUT. Additionally, the most common influencing factors found to affect the continuous use of mobile banking applications are perceived ease of use (prominent construct of TAM respectively "effort expectancy" as used in UTAUT and UTAUT 2), perceived usefulness (prominent construct of TAM respectively "performance expectancy" as used in UTAUT and UTAUT 2), user attitude (prominent construct in TAM) and social norms (prominent construct in UTAUT). Other factors have also been identified, such as, but not limited to, satisfaction, self-efficacy, privacy concerns, trust, and perceived risk.

We argue that the overutilization of conventional IS/IT adoption models might divert researchers' efforts from exploring other theories that own great opportunities to enrich the knowledge in the mobile banking domain. Our argument is supported by recent calls for future mobile banking research by utilizing theories other than the traditional IS/IT adoption theories/models (Carlos & Oliveira, 2017; Souiden et al., 2021; Susanto et al., 2016). We also argue that while an examination of the same factors contributes to a better understanding of user behavior toward mobile banking in different cultural contexts, it diverts researchers' efforts away from exploring other potential factors. It also might raise questions on what novelty/contributions would be offered to support the accumulation of knowledge in the mobile banking research domain (Souiden et al., 2021). The previous studies devoted great attention to examining psychological and sociological factors (i.e., perceived usefulness, perceived ease of use, satisfaction, user attitude, and social norms). Hence, exploring another set of factors that are tied to the specific needs of a research instead of repeating the investigation of the same factors seems critical.

The current research bridges/narrows the above-discussed research gaps as it focuses on the continuous use of mobile banking applications rather than their acceptance or adoption (examine actual us-

age). Continued usage ultimately determines the success of mobile banking (Patel & Patel, 2018). Despite its perceived importance, several recent reviews have pointed to the scarcity of the continuous use of mobile banking studies and called for more research on this research subject, mainly examining the factors that shape bank customers' decision to continue using mobile banking (Carlos & Oliveira, 2017; Inan et al., 2023; Oertzen & Odekerken-Schröder, 2019; Souiden et al., 2021).

As per our review, no previous studies have focused on understanding the virtualizability of banking monetary transaction processes, namely, the amenability and suitability of banking monetary transactions to be performed effectively via mobile banking applications. An evident gap in mobile banking studies relates to the lack of practical insights on the virtualizability of the banking monetary transaction processes. Thus, the current research uses the perspective of PVT as a lens for the investigation. The application of PVT significantly contributes to discovering different factors that are rarely being addressed in the context of mobile banking applications. Little research has been done on understanding the virtualizability of banking processes and how they could shape customers' continuous use. The current research moves a step further by integrating other important factors that are rarely addressed in the context of mobile banking applications. Such factors include the anthropomorphism of the mobile banking application and the virtual process failure risk. The full discussion of PVT and the research model, including proposed factors and hypotheses development, is presented in the following section.

RESEARCH FRAMEWORK

THE PROCESS VIRTUALIZATION THEORY (PVT)

The PVT is concerned with investigating Process Virtualizability (PV). PV refers to the degree to which a certain process is amenable to being conducted virtually without any physical interaction. PV could be practically measured as the proactive intention to use a virtual process or the current actual use of the virtual process. The PV is determined by two main sets of characteristics: the characteristics of the process and the virtualization mechanism.

First, the characteristics of the process are concerned with four requirements involved in physical or face-to-face processes – sensory, relationship, synchronism, and identification and control requirements. PVT supposes that PV is negatively influenced by each of the four requirements. When those requirements are perceived to be high for the process in question, the process would be less amenable to being conducted virtually. Accordingly, users would be more likely to perform such a process in physical places rather than virtually or online, and vice versa.

Second, the virtualization mechanism refers to the capabilities of the IS/IT to adequately transmit or satisfy a variety of the requirements of the process in question. This is measured by three technological capabilities – reach, representation, and monitoring. PVT supposes a positive impact of the three capabilities on PV. When IS/IT has sufficient powerful reach, representation, and monitoring capabilities to transmit or simulate the process requirements to the virtual or online environments, the physical process will be more amenable to being virtualized. Accordingly, users would be more likely to perform such a process virtually or online than in physical places and vice versa.

While PVT was initially anticipated to investigate the current use and adoption of IS/IT, it has shown great applicability in investigating the continuous use of IS/IT (Alarabiat et al., 2023). This seems rational as long as IS/IT, through representation, reach, and monitoring capabilities, continues to succeed in simulating, satisfying, matching, or addressing the process's characteristics (i.e., sensory, relationships, synchronism, and identification and control requirements involved in physical or face-to-face interactions). This will motivate users to continue using (or keep conducting) this virtual process instead of the traditional one in physical places.

RESEARCH MODEL

The current research concerns the virtualizability of banking processes, specifically the monetary transactions (e.g., transferring funds between accounts, making payments, paying purchasing goods at a point of sale, and remittances) rather than the nonmonetary banking transactions process (e.g., viewing and seeking details of savings accounts and/or credit card accounts). Previous research has focused on a specific type of mobile banking transactions (Alkhaldi, 2017; Carlos & Oliveira, 2016).

The research model, as depicted in Figure 1, supposes that the sensory requirements (SENS_ RQMT) and relationship requirements (RELATION_ RQMT) — which represent the requirements associated with conducting banking monetary transactions at banks/physical places — are supposed to have a direct negative impact on PV (H1 and H2). Correspondingly, representations (REPRESENT), reach (REACH), and monitoring (MONITOR) capabilities of the mobile banking application have a direct positive impact on PV (H3, H4, and H5). PV, in turn, is supposed to positively impact users' continuous use of the mobile banking application (CONT_USE) (H6). The research model further suggests that the anthropomorphism of the mobile banking application (ANTHROPHISM) has a direct positive impact on CONT_USE (H7). Finally, the virtual process failure risk (FAILURE) is supposed to have a direct negative impact on CONT_USE (H8).

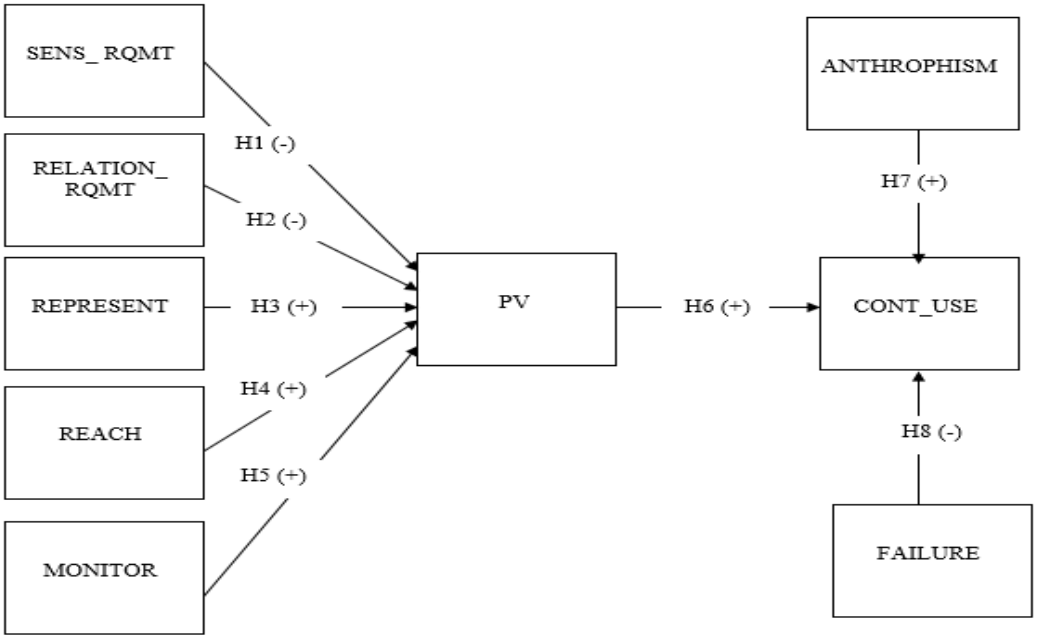

Figure 1. Research model

The integration of ANTHROPHISM reflects the current study's response to several calls for examining the role of ANTHROPHISM design on the use/continuous use of IS/IT (Cornelius & Leidner, 2021; Pfeuffer et al., 2019), particularly on the use/continuous use of mobile banking applications (R.-R. Lin et al., 2023). ANTHROPHISM refers to the attribution of human characteristics or behavior to a non-human or inanimate object (Epley et al., 2007). Accenture analysts indicate in a newly published study that banking digital channels, including mobile banking applications, are functionally correct but emotionally devoid as they lack the human touch (Abbott et al., 2023). Hence, considering ANTHROPHISM in the study model, it seems interesting to explore if designing mobile applications that have a human-like appearance or simulate human behavior might influence bank customers' continuous use of mobile banking applications. The FAILURE construct has been integrated into the study model since the perceived failure risk of performing activities online has often been found as a prominent barrier that largely impeded the acceptance, adoption, and use of new IS/IT

(Z. Lin et al., 2016). It could be argued that the possibility of making mistakes and the difficulty of rectifying such mistakes while conducting banking monetary transactions would impede bank customers from using/continuing banking mobile applications, compared to if they were conducted in bank branches, as they could receive immediate help or assistance. Accenture's recent global banking consumer study concludes that bank branches are still seen as a symbol of stability and are used for high-value and complex activities as the majority of bank consumers turn to branches to solve specific and complicated problems, which evidences that they desire to have direct interaction with their banks, perhaps due to the availability of immediacy help or assistance (Abbott et al., 2023). Slightly less than half of bank customers aged 18-44 had reported difficulty getting human support when they needed it online, according to the survey. Further discussion related to the research model constructs and the corresponding hypotheses is conducted.

HYPOTHESES DEVELOPMENT

Sensory requirements (SENS_ RQMT)

SENS_ RQMT refers to the need for the participant in a process to enjoy a full sensory experience like seeing, hearing, touching, tasting, or smelling the tangible/physical objects included in the process. It also might include sensations such as feelings of security (Overby, 2008, 2012).

PVT assumes a negative impact of SENS_ RQMT on PV. When SENS_ RQMT is high, the process becomes difficult or less amenable to virtualization. For example, the process of buying a vehicle in physical markets needs great SENS_ RQMT to inspect the vehicle conditions, including seeing, touching, and test driving. This high level of required SENS_ RQMT would highly impede the purchase of the vehicle online since such SENS_ RQMT are very difficult to simulate or fulfill in the online environment. Accordingly, users would be more likely to buy vehicles in physical markets rather than virtually (Overby & Konsynski, 2010). Several studies have confirmed the significant negative impact of the high level of SENS_ RQMT on adopting online airline check-in (Balci & Rosenkranz, 2014), remote working (Feng et al., 2023), and online learning (Alarabiat et al., 2023).

In the current study's empirical context, SENS_ RQMT refers to bank customers' need to satisfy various requirements related to human senses (visual, auditory, tactile, gustatory, and olfactory) when performing banking monetary transactions physically at banks' branches. This might include seeing and touching (or even smelling) money, seeing and hearing bank employees, and holding the relevant documents (such as deposit/transfer slips or receipts). The current research supposes that when bank customers pay greater attention to SENS_ RQMT, it will negatively influence their perception toward the amenability of banking monetary transaction processes to be conducted virtually via the mobile banking application (i.e., PV). Based on this assumption, the following hypothesis is proposed:

> **H1. Sensory requirements negatively impact mobile banking monetary transaction processes' virtualizability.**

Relationship requirements (RELATION_ RQMT)

RELATION_ RQMT refers to the participant's need to develop social interactions with other participants when performing a process. This relationship would facilitate exchanging information and knowledge (Overby, 2008, 2012). A higher RELATION_ RQMT leads to lower PV. For example, the high RELATION_ RQMT required by students during the learning process was found to negatively influence their perceptions toward the suitability of virtually performing this process (Alarabiat et al., 2023). Prior PVT research has established a negative influence of RELATION_ RQMT (Balci, Bedué, & Franzmann, 2013; Barth & Veit, 2011; Ofoeda et al., 2018).

In the current study, RELATION_ RQMT refers to a bank customer's need to physically communicate and socialize with bank employees. Such interaction often aims to build trust and friendship and to exchange relevant information. It also could ease and accelerate monetary banking transactions by getting help or guidance from bank employees to fill in the required information and detect errors.

As such, personal relationships are difficult (if not impossible) to develop online, and the perception of bank customers who greatly consider RELATION_ RQMT toward the amenability of banking transaction processes to be conducted virtually will be low. Accordingly, we propose the following hypothesis:

H2. Relationship requirements negatively impact mobile banking monetary transaction processes' virtualizability.

Representation capability (REPRESENT)

REPRESENT refers to the technological capability of the system (i.e., a website or a mobile application that is being used as a digital means to migrate the physical process in question into a virtual process) to perfectly present relevant information related to the process. PVT assumes that a high REPRESENT will positively impact the process, thereby leading it to be easily virtualized, i.e., PV. Previous PVT studies have shown the significant direct and positive impact of REPRESENT on using a wide range of online or virtual processes in various contexts, including telemedicine (Serrano & Karahanna, 2016), e-commerce (Overby & Konsynski, 2010), e-government (Barth & Veit, 2011; Ofoeda et al., 2018) and e-learning (Alarabiat et al., 2023).

The current research considers REPRESENT to be the capability of the mobile banking application to present and share supporting and relevant information pertaining to the banking monetary transaction processes in a suitable and efficient way. For instance, it includes providing helpful/useful information and visual tutorials on how to perform monetary transactions, as well as offering the ability to send, download, and save related proof documents. The current research suggests that the sufficient REPRESENT of mobile banking applications to effectively present the needed/required information in order to accomplish monetary transactions will increase the bank customer's perception toward the amenability of banking monetary transaction processes to be conducted online via the application (i.e., PV). This argument forms the basis for the following hypothesis:

H3. Representation capability positively impacts mobile banking monetary transaction processes' virtualizability.

Reach capability (REACH)

REACH is the capability of a system or a technology to enable the user to perform the process activities quickly and effectively across space and time. The positive impact of REACH on PV has been often proven. For instance, the REACH of online flight check-in systems allows passengers to accomplish the check-in process themselves, anytime and anywhere, without having to be assisted physically or personally contact counter clerks at the airport (Balci & Rosenkranz, 2014). The REACH capability has also been found to encourage citizens to use e-government services (Barth & Veit, 2011) and students to continue using online learning (Alarabiat et al., 2023).

In our empirical context, REACH refers to the capability of the mobile banking application to enable bank customers to readily access their bank's accounts for conducting a variety of banking monetary transactions virtually, whenever and wherever they are, irrespective of the working hours of banks. Therefore, we assume a positive impact of REACH on customers' perception toward the virtualizability of the banking monetary transactions process. Accordingly, the following hypothesis is formulated:

H4. Reach capability positively impacts mobile banking monetary transaction processes' virtualizability.

Monitoring capability (MONITOR)

MONITOR refers to the system's capacity to identify and authenticate legitimate participants eligible/authorized to participate in a process. It also includes the capability of the system to track (or record) participants' activities or actions. MONITOR could be maintained by applying various authentication systems, tools, and procedures, thereby preventing any unauthorized access attempts.

According to PVT, MONITOR seems critical in different virtual processes, e.g., online shopping and online dating (Overby 2008, 2012). The absence or weakness of the same could raise the risk of fraud and monetary loss, as in the case of online shopping, and acts of harassment, such as in online dating.

In our empirical context, bank customers need to be sure that the mobile banking application applies strict and sufficient authentication measurements and procedures to protect their financial accounts from being hacked. Prior mobile banking studies stress the role of sufficient security procedures, tools, and measurements to prevent illegal external access, which may cause leakage of private data or/and misappropriation of funds (Baptista & Oliveira, 2016; Patel & Patel, 2018; Souiden et al., 2021). We assume MONITOR has a positive impact on mobile banking applications' virtualizability in banking monetary transactions. Therefore, the following hypothesis is formulated:

H5. Monitor capability positively impacts mobile banking monetary transaction processes' virtualizability.

Process virtualizability (PV)

The PV refers to the amenability of the banking monetary transactions process to be readily migrated from the bank's physical sites in order to be conducted virtually via the mobile banking application. PV has been measured as the bank customers' actual use of mobile banking applications to accomplish different banking monetary transactions against the traditional ways of physically visiting the bank branches. As the research model suggests, PV is expected to be negatively influenced by the requirements of banking monetary transactions. However, it is expected to be positively influenced by the capabilities of the mobile banking application.

While some previous studies have called for further research to extend PVT in order to examine continuous usage, there is limited focus on investigating the impact of PV on continuous use behavior (Alarabiat et al., 2023). The recent study of Alarabiat et al. (2023) examines the impact of PV of online learning on students' intention to continue using online learning, which is positive. This finding suggests that when a PV is perceived as high by users, they will continue conducting the process virtually instead of in physical places.

Hence, as long as the system that is used to virtualize the process in question continues to succeed in simulating and transmitting the process requirements involved in physical or face-to-face interactions through sufficient capabilities, the continuous use of the virtual process will be maintained. For example, passengers would continue using online check-in systems to complete the check-in process every time they travel, and the system would continue to provide a perfect virtual environment for accomplishing the check-in process in a manner similar to that at the airport.

Accordingly, the current study suggests that when bank customers show a high positive perception toward the virtualizability of the banking monetary transaction process (high PV), their continuous use of mobile banking applications will be high. In other words, as long as mobile banking applications succeed in creating a virtual environment for executing banking monetary transactions similar to those done at the bank's physical sites, the bank customers' use of mobile banking applications will continue. Therefore, we propose the following hypothesis:

H6. Processes virtualizability of banking monetary transaction processes positively impacts the continuous use of mobile banking applications.

Anthropomorphism (ANTHROPHISM)

ANTHROPHISM refers to the attribution of human characteristics or behavior to a non-human or inanimate object (Epley et al., 2007). The concept of ANTHROPHISM in technology could be understood as designing human-like systems that either have human-like looks (image or appearance) or simulate human behavior (functions and/or roles) (Cornelius & Leidner, 2021). Put simply, anthropomorphism refers to the design of a system that could look, think, and behave like human beings. According to many recent studies, a higher level of ANTHROPHISM of a system (i.e., simulating

human looks and behavior) enhances the user's perception of the fitness and usefulness of such a system, thereby increasing its use (Gursoy et al., 2019; Pfeuffer et al., 2019). For example, the anthropomorphism design has been found to play a positive role in shaping the perception, use, and continued use of artificial intelligence-based information systems (Li & Suh, 2021; Moussawi et al., 2021). The interest in investigating the anthropomorphism features and design on user intentions to use IS/IT started early. Qiu and Benbasat (2009) investigated the impact of applying anthropomorphic interfaces of an online shopping virtual agent (which simulates or replaces the human salesperson roles) and found that the voice-based communication of the online shopping product recommendation agent, similar to the human voice, significantly influences user intention to use/communicate with the virtual agent as a purchase decision aid.

In our context, ANTHROPHISM signifies the mobile banking application's capability to behave similarly/closely to the bank's assistant's behavior or roles when processing banking transactions. For example, guiding users to follow required steps, check and verify the filled information, detect errors, and confirm the transaction's successful execution. Customer experience could be enhanced using anthropomorphized Chatbots. It helps build social connections, simulating emotional connections (Sarraf et al., 2024). The anthropomorphic Chabot can be deployed by using multiple cues such as a human name, photorealistic human avatar, use of emojis, and verbal cues where the Chatbots attempt to mimic human patterns (Schuetzler et al., 2021) would enrich mobile banking applications with greater human touch. Recently, the ANTHROPHISM of mobile banking applications has been identified to play a significant role in effectively helping users complete banking transactions (Lee & Chen, 2022). It also has a direct positive impact on fostering the continuous use of banking mobile applications (R.-R. Lin et al., 2023). Accordingly, the ANTHROPHISM of mobile banking applications will increase bank customers' continuous use of mobile banking applications. Therefore, we hypothesize that:

H7. The anthropomorphism of the mobile banking application positively impacts bank customers' continuous use of the mobile banking application.

The virtual process failure risk (FAILURE)

The perceived risk of performing online activities has often been found to be a prominent barrier that largely impeded the use of new IS/IT (Z. Lin et al., 2016). The perceived risks impeded the use and continuous use of mobile banking applications (Farah et al., 2018; Giovanis et al., 2019; Souiden et al., 2021). However, previous studies mainly considered the risks associated with deficiencies in the operating system itself; these include security risks (the leak of personal data privacy protection), privacy risks (the security of making payments online), and performance risks (the effectiveness of the mobile application on time and quickly) (Alsmadi et al., 2022). Nevertheless, few studies have focused on the risk resulting from the users' side, including the mistakes users make when using mobile banking applications rather than errors occurring due to technical deficiencies in the application operating system (Carlos & Oliveira, 2017). The current study considers the virtual process failure risk (FAILURE) of bank customers' fears about the possibility of being prone to making mistakes while using the mobile banking application, along with the difficulty of rectifying such mistakes. Compared to physical processes conducted in bank branches, customers may even perceive that they will face more uncertainties and less help if they conduct banking monetary transactions virtually through mobile banking applications.

The suggested construct (i.e., FAILURE) concerns the failure from the users' side, i.e., a 'human' mistake rather than from the bank due to deficiencies in the operating system. FAILURE may come in terms of customers providing incorrect/invalid details, thereby causing operation failure and/or financial loss. For example, putting in the wrong bank account number and wrong/missing information field, failing to insert the correct amount of money, hitting the wrong key, or transferring money to another bank account instead of the intended one, thereby causing operation fails and/or financial loss. Compared to conducting banking transactions at the physical location of a bank, users may face more uncertainties if they conduct banking monetary transactions virtually through mobile

banking applications as there is no direct contact with the bank's employee responsible for checking and/or rectifying mistakes, if any. Therefore, we assume that for bank customers who would perceive a high risk of failing to conduct banking transactions themselves virtually, their intention to continue using the mobile banking application will be lower. Hence, we propose the following hypothesis:

H8. The virtual process failure risk negatively impacts bank customers' continuous use of the mobile banking application.

RESEARCH METHODOLOGY

MEASUREMENT

The research model includes nine constructs, each of which was measured with multiple items that were adapted from prior scientific research. The measured items have been carefully tailored to be in line with the context of mobile banking applications, considering the construct explanation provided in the original works of PVT (Overby, 2008, 2012), as follows. The study's measurement items for SENS_ RQMT and RELATION_ RQMT were adapted from Balci, Grgecic, and Rosenkranz, (2013), Balci and Rosenkranz (2014), Graupner and Maedche (2015), and Overby and Konsynski (2010). The items of REPRESENT, REACH, and MONITOR capabilities, in addition to PV items, were adapted from Balci, Grgecic, and Rosenkranz, (2013), Barth and Veit (2011), and Ofoeda et al. (2018). Further, the items for ANTHROPHISM were basically drawn from R.-R. Lin et al. (2023) and Lee and Chen (2022), and the items for FAILURE were derived from Barth and Veit (2011) and Graupner and Maedche (2015). Finally, for the items for CONT_USE, we compiled a set of items from Baabdullah et al. (2019), Rabaa'i and AlMaati (2021), and Yuan et al. (2016).

The survey questionnaire items were first developed in English and reviewed by a panel of seven experts to ensure content validity. The panel consists of three IS academics, two bank employees, and two users of mobile banking applications. Based on their feedback, some items were revised to enhance clarity and understandability. As the study was conducted in an Arabic native language society, Jordan, the questionnaire was translated to Arabic using Brislin's (1970) backward-translation approach to ensure equivalence. The indicators in the survey were measured using a five-point Likert scale, representing from strongly disagree (1) to strongly agree (5). To test the instrument before a field launch, a pilot study was conducted on 15 bank customers whose responses were not included in the final analysis. The results obtained from the pilot study showed generally satisfactory levels of reliability and validity of the items. However, when conducting the survey on a large scale, some items were dropped because they led to problematic reliability (i.e., SENS_ RQMT2, ANTHROPHISM4, FAILURE 2 and 3). The final items included in the study questionnaire and their supported sources are listed in Table 1. The validity and reliability values of the included items are depicted in Table 3.

Table 1. Study questionnaire items

Construct	Items	Sources
SENS_ RQMT	While I am conducting/performing/executing the banking transaction process at the bank, I ……	Balci, Grgecic, and Rosenkranz, (2013), Balci and Rosenkranz (2014), Graupner and Maedche (2015), Overby
	SEN_ RQMT1. I like seeing, touching, and smelling banknotes/cash. SEN_ RQMT2. I like to see and hear the employees of the bank.*	
	SEN_ RQMT3. I like the safety and comfort provided by the bank.	

Construct	Items	Sources
	SEN_ RQMT4. When I accomplish the process of banking monetary transactions, I verify the same and keep holding the relevant documents (such as proof documents, deposit slips, transfer slips, or receipts).	and Konsynski (2010)
RELATION_ RQMT	While I am conducting/performing/executing the banking transaction process at the bank, I …… RELATION_ RQMT1. I enjoy talking to responsible employees (employees/managers).	Balci, Grgecic, and Rosenkranz, (2013), Balci and Rosenkranz (2014), Graupner and Maedche (2015), Overby and Konsynski (2010)
	RELATION_ RQMT2. It is important to me to establish a personal or friendly relationship with the responsible bank persons (employees/managers).	
REPRESENT	REPRESENT1. The mobile banking application provides me with the information I need to know about the monetary transaction that I intend to perform.	Balci, Grgecic, and Rosenkranz, (2013), Barth and Veit (2011), Ofoeda et al. (2018).
	REPRESENT2. The mobile banking application provides me with helpful, attractive, and understandable information about the monetary transaction that I intend to perform.	
	REPRESENT3. The mobile banking application provides me with helpful visual tutorials about the monetary transactions that I intend to perform.	
	REPRESENT4. The mobile banking application enables me to send and/or save relevant documents of the banking monetary transactions, such as proof documents, deposit slips, transfer slips or receipts.	
	REPRESENT5. The visual interface technology of the mobile banking application is attractive and well-organized.	
REACH	REACH1. By using the mobile banking application, I can conduct my banking monetary transactions wherever I want – at home, at work, or wherever I go.	Balci, Grgecic, and Rosenkranz, (2013), Barth and Veit (2011), Ofoeda et al. (2018)
	REACH2. By using the mobile banking application, I conduct my banking monetary transactions whenever I want – around-the-clock and without delay.	
MONITOR	MONITOR1. Authentication systems used through the mobile banking application, such as ID/password combinations and biometric tokens, are very efficient.	Balci, Grgecic, and Rosenkranz, (2013), Barth and Veit (2011), Ofoeda et al. (2018)
	MONITOR2. The mobile banking application could detect any unauthorized attempt to enter my bank account.	
	MONITOR3. The mobile banking application has sufficient procedures to prevent fraud from using my bank account.	
PV	PV1. The banking monetary transactions process could be performed online (or virtually) using the mobile banking application.	Balci, Bedué, and Franzmann (2013), Barth and Veit (2011)
	PV2. The mobile banking application facilitates performing my banking transactions.	
	PV3. Overall, performing banking transactions using the mobile banking application is more convenient than visiting the physical place of my bank.	
ANTHROPHISM	ANTHROPHISM1. The mobile banking application verifies the information filled in and detects errors during the bank transaction, as well as confirms the transaction's successful execution.	R.-R. Lin et al., (2023), Lee and Chen (2022)
	ANTHROPHISM2. The mobile banking application provides an AI-based virtual banking assistant.	

Construct	Items	Sources
	ANTHROPHISM3. The mobile banking application guides me very well to execute the banking monetary transactions successfully (clear steps and procedures).	
	ANTHROPHISM4. The mobile banking application seems to be responding to me like a person.*	
	ANTHROPHISM5. Using the mobile banking application to complete banking transactions feels similar to interacting with a real person.	
FAILURE	FAILURE1. While using a mobile banking application, there is a high possibility of being prone to making mistakes.	Barth and Veit (2011), Graupner and Maedche (2015)
	FAILURE2. While using the mobile banking application, I always suspect that the monetary transaction did not execute perfectly/completed correctly.*	
	FAILURE3. Making mistakes or correcting the mistakes that would occur in performing banking transactions on mobile banking applications results in costs/fines/or penalties.*	
	FAILURE4. While using the mobile banking application, I fear losing money by hitting the wrong key(s).	
	FAILURE5. While using a mobile banking application, any mistake is hard to rectify or to correct (the mobile banking application does not allow me to rectify the mistakes that I would make).	
	FAILURE6. My bank has a no-tolerance policy for mistakes that would occur as a result of using the mobile banking application.	
CONT_USE	CONT_USE1. I intend to continue using the mobile banking application frequently in the future.	Baabdullah et al. (2019), Rabaa'i and AlMaati (2021), Yuan et al. (2016)
	CONT_USE2. I am most likely to continue using the mobile banking application in the future.	

Note: *Dropped items

SAMPLING AND DATA COLLECTION

The current study's main focus is the continuous use of mobile banking applications; hence, the intended respondents needed to already have experience with using mobile banking applications. For that reason, we used a non-probabilistic sampling technique to get a more precise sample. The data was gathered using an online survey. The survey invitation links were sent via email and posted in several social media groups or pages, providing hyperlinks to the questionnaire. We also recruited a research assistant to collect respondents personally in front of several bank branches.

The data was gathered only from bank customers who had direct experience with mobile banking applications to conduct banking monetary transactions. To ensure this, study subjects were asked whether they had performed any monetary transactions via mobile banking applications at least once in the last three to six months. While respondents who answered 'No' were immediately directed to a thank-you message and exited from the survey, respondents who answered 'Yes' were directed to the survey. We have developed a short introduction to the online survey, outlining its focus and goals, addressing and ensuring privacy concerns, and anonymity, and indicating the approximate amount of time the survey will take to fill out. Around 578 responses were collected. We excluded 94 responses since associated respondents currently use mobile banking applications but only for simple banking transactions such as viewing balances and details of accounts and/or credit card accounts, which means they had not used banking mobile applications for banking monetary transactions. Finally, 484

respondents who truly use mobile banking applications to conduct various banking monetary transactions were selected for the surveys.

FINDINGS

Table 2 shows that the majority of respondents (69.5%) were male, while 30.5% of the respondents were females. Considering that using mobile banking applications means that the user already has a bank account, the gender-based respondents' distribution in our sample might reflect the gender financial inclusion gap in Jordan. According to the Global FINDEX Database 2021 report by the World Bank, only 34% of Jordanian females have a bank account, while 59% of their male counterparts have one (Demirgüç-Kunt et al., 2022). The sample profile shows that slightly more than half of our sample's respondents (52.8%) were between the ages of 25 and 44 years, and most of them were workers (76.4%) rather than students. This observation is very important to overcome the threat to the validity and generalisability of our findings since young students may not fully represent the population of banking users (Carlos & Oliveira, 2016). Concerning the place of living, most participants were from Amman, i.e., the capital. This was expected as it is the most populous city in the country, as well as where most banks' branches are located. As per the report by Association of Banks in Jordan (2021), Amman hosts 537 of 875 branches (61%) and is affiliated with 26 banks in operation in Jordan.

Table 2. Sample demographic profile

Item		No. of respondents	Percentage (%)
Gender	Male	336	69.5
	Female	148	30.5
Age	18–24 years	129	26.6
	25–34 years	67	15.7
	35–44 years	180	37.1
	45–54 years	80	16.5
	Old than 55 years	28	4.1
Education	Diploma	81	16.7
	Bachelor's	283	58.4
	Master's	75	15.5
	Ph.D.	45	9.3
Job level	Student	31	6.4
	Employee/ public sector	175	36.1
	Employee/ private sector	145	30.0
	Own private business	30	6.2
	Military	20	4.1
	Retired	61	12.7
	Unemployment	22	4.5
Living place	Amman (capital)	313	64.6
	Northern region	25	5.2
	Central region	121	25
	Southern region	25	5.2
Experience with using mobile banking applications	Less than 1 year	96	19.8
	1–2 years	74	15.2
	2–3 years	97	20.1
	3–4 years	92	19.1
	More than 4 years	125	25.8

DATA ANALYSIS

The analysis method employed in this work is structural equation modeling using partial least squares (SEM-PLS). SEM-PLS is highly recommended for theory development and testing a new research model and measurements that have not previously been widely tested in the literature (Hair et al., 2019). SEM-PLS shows satisfactory predictive power by placing less stringent requirements on the distributions (it does not require items in research data to be distributed normally) (Anderson & Gerbing, 1988; Chin, 1998; Hair et al., 2019). Hence, SEM-PLS is considered a convenient method for this research. To validate the research model, we have applied a two-step modeling approach method – the measurement model and the structural model – as suggested by Anderson and Gerbing (1988) using SmartPLS4 software.

MEASUREMENT MODEL

The measurement model analysis aims to ensure the robustness and validity of the analysis and the research outcomes. It is usually verified by evaluating several criteria: indicator reliability, construct internal consistency reliability, convergent validity, and discriminant validity. The analysis results for the measurement model, which are reported in Table 3 and Table 4, indicate an adequate measurement model in terms of reaching good internal consistency, indicator reliability, convergent validity, and discriminant validity as follows.

The indicator reliability was evaluated by only considering items with factor loading above 0.708 (Hair et al., 2019). Table 3 shows that all items' factor loadings are above the cut-off value (=0.708); there are two exceptions: SEN_ RQMT1 and SEN_ RQMT3, as they were loaded 0.59 and 0.64, respectively. However, we decided to keep both items since the ones with a significant loading = ≥0.50 could be included if there is a good justification for the same (Hair et al., 2019). Both items have been developed in the literature for the first time in the current study, and according to Awang (2014), newly developed items with a significant loading of 0.50 could be accepted. Further, considering the parsimonious empirical testing of PVT in the mobile banking application discipline and the significant importance of the SEN_ RQMT construct in the PVT, we believe they strongly support including both items.

The internal consistency reliability was ensured by testing Cronbach's alpha (Alpha) and composite reliability (CR). While Alpha is bound lower, CR is the upper bound for internal consistency reliability, both of which recommended minimum thresholds greater than 0.70 and lower than 0.95 (Hair et al., 2019). As per Table 3, the values of Alpha and CR exceed the recommended threshold, indicating that the model has good internal consistency.

Table 3. Measurement model results

Measurement	Items	Loading	Alpha	Cr	Ave
SEN_ RQMT	SEN_ RQMT 1	0.594	0.706	0.747	0.503
	SEN_ RQMT 3	0.640			
	SEN_ RQMT 4	0.864			
REALTION_ RQMT	REALTION_ RQMT 1	0.852	0.704	0.870	0.770
	REALTION_ RQMT 2	0.903			
REPRESENT	REPRESENT1	0.810	0.884	0.915	0.682
	REPRESENT2	0.827			
	REPRESENT3	0.856			
	REPRESENT4	0.834			
	REPRESENT5	0.803			
REACH	REACH1	0.949	0.865	0.914	0.880
	REACH2	0.927			

Measurement	Items	Loading	Alpha	Cr	Ave
MONITOR	MONITOR1	0.864	0.821	0.892	0.734
	MONITOR2	0.899			
	MONITOR3	0.805			
PV	PV1	0.894	0.880	0.926	0.807
	PV2	0.914			
	PV3	0.886			
ANTHROPHISM	ANTHROPHISM 1	0.780	0.860	0.898	0.688
	ANTHROPHISM 2	0.898			
	ANTHROPHISM 3	0.748			
	ANTHROPHISM 5	0.882			
FAILURE	FAILURE 1	0.723	0.814	0.892	0.637
	FAILURE 4	0.834			
	FAILURE 5	0.777			
	FAILURE 6	0.852			
CONT_USE	CONT_USE1	0.928	0.821	0.918	0.848
	CONT_USE2	0.913			

Regarding convergent validity, the average variance extracted (AVE) test is recommended to be applied with a threshold of at least 0.50 to confirm convergent validity. As shown in Table 3, all nine constructs have an AVE higher than the recommended minimum threshold of 0.50.

Finally, the Fornell-Larcker test was employed to assess the discriminant validity. The test requires that the square root of the AVE for each construct be greater than its correlation coefficients with other constructs (Fornell & Larcker, 1981). As seen in Table 4, the square root of the AVEs (diagonal elements) for each construct is greater than the correlation coefficients with other constructs in the model (off-diagonal elements). The analysis of the Fornell-Larcker test acknowledges the existence of discriminant validity. The above satisfactory measurements' reliability and validity illustrate that the constructs are statistically different and can be used to assess the structural model. Thus, we can confidently move to the next step and test the structural model.

Table 4. Fornell and Larcker's discriminant validity test

Measurement	1	2	3	4	5	6	7	8	9
SEN_ RQMT (1)	**0.709**								
REALTION_ RQMT (2)	0.634	**0.877**							
REPRESENT (3)	0.075	0.156	**0.826**						
REACH (4)	0.003	0.091	0.499	**0.938**					
MONITOR (5)	0.192	0.694	0.692	0.694	**0.857**				
PV (6)	0.115	0.136	0.584	0.699	0.758	**0.898**			
ANTHROPHISM (7)	0.261	0.252	0.717	0.354	0.595	0.366	**0.830**		
FAILURE (8)	0.294	0.209	0.016	0.043	0.005	0.011	0.253	**0.798**	
CONT_USE (9)	0.658	0.107	0.649	0.658	0.670	0.680	0.409	-0.108	**0.921**

Note: The square roots of the constructs' AVE values are shown in the diagonal line (in bold); non-diagonal elements are latent variable correlations.

STRUCTURAL MODEL

The study structure model was tested following Hair et al.'s (2019) approach and includes three steps. *First, examining the collinearity problem*. The collinearity problem occurs when independent factors included in the model correlate with each other more than their correlation with the dependent factor. The collinearity problem exists when the value Variance Inflation Factor (VIF) is more than 5. In our study model, the multicollinearity is not challenged as VIF values are below 5 (ranging from 1.082 for SEN_ RQMT to 2.922 for REPRESENT).

Second, the predictive power of the model. We examined the predictive power of the model considering the R2-adjusted value. The study model can explain 0.675 of the variation for CONT_USE and 0.638 of the variation of PV. The obtained R^2 values are significantly satisfactory (Hair et al., 2019). Next, to assess R^2-adjusted values, it is also recommended to examine the size effect (f^2) and predictive relevancy (Q^2). The size effect (f^2) identifies key variables with the highest relevance in explaining the endogenous latent construct. The values of f^2 within 0.02, 0.15, and 0.35 depict small, medium, and large f^2 effect sizes. The f^2value of PV on CONT_USE is 0.413, which depicts a large effect size. The f^2 values of ANTHROPHISM and FAILURE on CONT_USE are 0.077 and 0.059, which indicate a small effect size. The results also show a medium effect size of MONITOR (f^2=0.185) and REACH (f^2=0.155) on PV and a minor effect size of REPRESENT (f^2=0.016) on PV. The predictive relevancy (Q^2) was evaluated to assess the model's predictive accuracy. Q^2 values higher than 0, 0.25, and 0.50 depict small, medium, and large predictive relevance. The Q^2 values obtained using the blindfolding procedure are above zero (0.549 for CONT_USE and 0.626 for PV), indicating a predictive accuracy of the study structural model.

Third, the significance of path coefficients. Table 5 and Figure 2 display the results of the path coefficients and p-values for all the proposed hypotheses. The results of path analysis illustrate that PV (β=0.733; p<0.000) and ANTHROPHISM (β=0.177; p<0.000) have a significant positive effect on CONT_USE, while FAILURE (β=-0.145; p<0.000) has a significant but negative effect on CONT_USE. The results support hypotheses H6, H7 and H8. Further, the results show that SEN_ RQMT (β=-0.029; p<0.005), REPRESENT (β=0.106; p<0.05), REACH (β=0.336; p<0.000) and MONITOR (β=0.447; p<0.000) have a significant positive effect on PV; consequently, H1, H3, H4 and H5 are supported. However, no significant effect was found produced by RELATION_ RQMT on PV (β=0.011; p<0.132), so H2 is not supported.

Table 5. Hypotheses analysis results

No.	Hypothesis path	Beta (B)	T Value	F2	Q2	P Value	Result
H1	SENS→PV	-0.029	0.445	0.001	0.626	0.05***	Supported
H2	RELATION→PV	-0.011	0.233	0.000	0.626	0.132	Not supported
H3	REPRESENT→PV	0.106	1.977	0.016	0.626	0.05***	Supported
H4	REACH→PV	0.336	8.598	0.155	0.626	0.000*	Supported
H5	MONITOR→PV	0.447	7.935	0.185	0.626	0.000*	Supported
H6	PV→CONT_USE	0.733	32.968	0.413	0.549	0.000*	Supported
H7	ANTH →CONT_USE	0.177	5.532	0.077	0.549	0.000*	Supported
H8	FAILURE→CONT_USE	-0.145	5.374	0.059	0.549	0.000*	Supported
*p ≤ 0.001, **p ≤ 0.01, ***p ≤ 0.05							

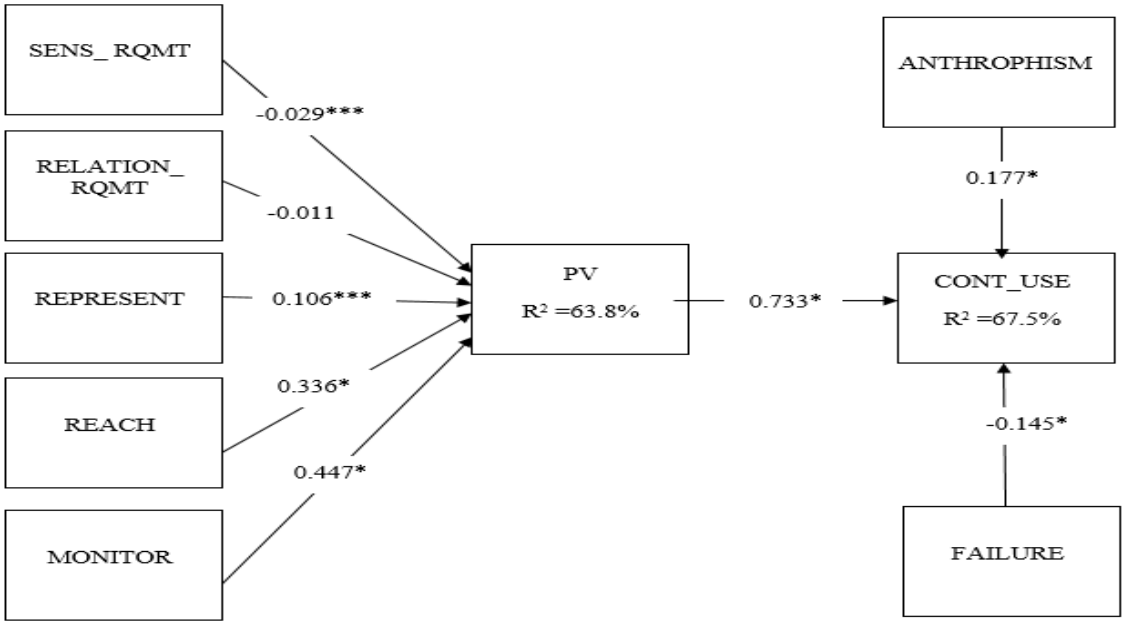

Figure 2. Path analysis results

Finally, the study verifies an indirect effect path. As shown in Table 6, there are significant indirect impacts of MONITOR (β=0.328; p < 0.000), REACH (β=0. 0.247; p < 0.000), SEN_ RQMT (β=-0.021; p < 0.005) and REPRESENT (β=0.078; p < 0.05) on CONT_USE, mediated by PV. The interpretation of the results is discussed in the next section.

Table 6. Indirect paths analysis results

Path	Original sample	Sample mean	SD	T	P Values
MONITOR -> PV -> CONT_USE	0.328	0.326	0.041	7.918	0.000*
REACH -> PV -> CONT_USE	0.247	0.249	0.031	8.000	0.000*
SEN_ RQMT -> PV -> CONT_USE	-0.021	0.028	0.047	0.449	0.005**
REPRESENT->PV-> CONT_USE	0.078	0.079	0.039	1.972	0.049***

*p≤0.001, **p≤0.01, ***p≤0.05

DISCUSSION AND IMPLICATIONS

The analysis results have revealed that CONT_USE is positively influenced by PV and ANTHROPHISM but negatively influenced by FAILURE. The three constructs collectively explain 67.5% of the variance in CONT_USE, which could be seen as relatively high since the current study concerns the prediction of human behavior intentions (Hair et al., 2019).

Specifically, PV has the strongest positive impact on CONT_USE. This proves the significant relationship between both constructs, as suggested by the research model. The paucity of studies that extended and practically applied PVT for examining continuous usage (Alarabiat et al., 2023) challenges the corroboration or contradiction of our findings with previous similar studies. The study result could be rationally interpreted as: as long as the mobile banking applications continue to successfully provide users with a virtual environment for executing banking monetary transactions similar/equivalent to the face-to-face environment that occurs at the bank's physical sites; thus, arguably, the bank customers would most probably continue using mobile banking applications for conducting banking monetary transactions.

The study results indicate the positive impact of ANTHROPHISM on CONT_USE. This study finding is consistent with recent studies that have found a direct positive impact of ANTHROPHISM on CONT_USE of mobile banking applications (Lee & Chen, 2022; R.-R. Lin et al., 2023). Generally, there is scarce empirical research focusing on investigating the impact of ANTHROPHISM in the mobile banking context so far. Nevertheless, the result could be interpreted that when the mobile banking application shows a sufficient capability to behave closely similar to the bank's assistant or employee behavior, bank customers would be better enabled to complete various banking monetary transactions easily, effectively, and securely, as though they were interacting with real people (Lee & Chen, 2022; R.-R. Lin et al., 2023; Moussawi et al., 2021). As per some reports, mobile banking applications are emotionally devoid as they lack the human touch (Abbott et al., 2023). Thus, the humanoid embodiment and human voice-based communication via mobile banking applications would improve mobile banking applications with a better human touch and significantly foster their continuance use of banking mobile applications. Today, many banks have implemented virtual assistants via their mobile applications to help customers manage their online banking inquiries and transactions. Further, an increasing number of banks are embracing AI technologies in their applications either by providing a specific AI-powered virtual bank assistant or by integrating personal intelligent agents, e.g., Apple's Siri, Amazon's Alexa, and Samsung Bixby. This mainly aims, through voice command, to enable users to complete various banking services, including financial transactions, easily, effectively, and securely as if they were interacting with real people (Lee & Chen, 2022; R.-R. Lin et al., 2023).

The found significant negative effect of FAILURE is reasonable; bank customers who feel a high possibility of incorrectly proceeding or performing banking monetary transactions via the mobile banking application are, consequently, more reluctant to continue using the mobile banking application. Since this is one of the first studies that considered FAILURE due to a 'human' mistake (users' side) rather than due to technological deficiencies of mobile banking applications, arguably, there are no similar studies to compare our findings. However, the results of this study could be related to the users' self-efficacy. Self-efficacy relates to one's perception of individual effectiveness in executing a particular task. In our context, bank customers with high levels of self-efficacy are more confident in their ability to conduct banking monetary transactions via mobile banking applications with little possibility of being prone to making mistakes — and vice versa. Several previous studies have confirmed that the greater perceptions of self-efficacy that users possess, the greater the likelihood they will continue using mobile banking applications (Foroughi et al., 2019; Naruetharadhol et al., 2021; Rabaa'i & AlMaati, 2021).

The study results confirm the direct positive effect of the MONITOR, REACH, and REPRESENT capabilities of the mobile banking application on PV. The correlation of significant constructs collectively explains 63.8% of the variance in PV. This result demonstrates the significant impact of the three constructs on increasing the users' perception toward the suitability of banking monetary transactions to be virtualized or conducted online (i.e., PV).

The critical role of MONITOR capability is clearly established in the current study. The high MONITOR reduces the risk of being under fraud, thus increasing the feeling of being more secure. The study finding confirms the critical role of providing sufficient procedures to prevent unauthorized access attempts or identity theft (Baptista & Oliveira, 2016; Carlos & Oliveira, 2017; Souiden et al., 2021). The result matches with one of the underlying assumptions of PVT and with previous related mobile banking studies that confirm the significant role of security procedures on user intention to continue using mobile banking applications (Naruetharadhol et al., 2021; Patel & Patel, 2018; Souiden et al., 2021). Hence, bank customers would consider the mobile banking application as a secure means for completing transactions, eventually increasing their continuous usage of the mobile banking application. MONITOR could be maintained by applying various authentication tools and procedures, such as digital identity, password combinations, and biometric tokens (e.g., voice- and facial recognition-based biometric systems). The study findings are associated with prior research

findings related to the positive effect of guaranteeing transaction security, protection of information, and transactional confidentiality on users' adoption/continuous use of mobile banking applications (Baabdullah et al., 2019; R.-R. Lin et al., 2023; Yuan et al., 2016).

As per the analysis results, bank customers greatly value the REACH capability since they can perform various banking transactions at their convenience. The result is indeed in line with the underlying assumption of PVT that when a system permits users to perform a process at their convenience, the process can be more amenable to virtualization. This finding echoes the existing prior research findings related to the significant positive role of REACH in using various virtual processes, such as telemedicine (Serrano & Karahanna, 2016), executing e-government services (Ofoeda et al., 2018) and continuous use of e-learning (Alarabiat et al., 2023). Our result is also in line with several previous studies that established the positive impact of customers' capability to manage various banking services via mobile banking at the time and place of their choice on their intentions to continue using mobile banking applications (Carlos & Oliveira, 2016; Yuan et al., 2016). The results reveal that the REPRESENT capability seems relatively important from the respondents' viewpoint. The study's findings confirm previous PVT studies related to the positive impact of REPRESENT on using different virtual processes, e.g., telemedicine services (Serrano & Karahanna, 2016) and e-learning (Alarabiat et al., 2023). Our result confirms that REPRESENT is in line with previous related findings, in that offering attractive and high-quality information is one of the most important antecedents to facilitating users' continuance usage of mobile payment (Zhou, 2013).

The study results reveal the significance of SENS_ RQMT on PV. The results are aligned with previous findings that there is a negative relationship between SENS_ RQMT and using various virtual processes (Alarabiat et al., 2023; Balci & Rosenkranz, 2014). However, contrary to our expectations, RELATION_ RQMT was not found to have a significant impact on PV, indicating that RELATION_ RQMT might no longer be a barrier to virtualizability of banking transactions.

One possible explanation for the little role/effect of SENS_ RQMT (β=-0.029) and the non-significant effect of RELATION_ RQMT on PV is that both constructs' effect might be decreased or diminished with time and with the user's experience. As per our sample, a majority of the respondents (65%) have been using mobile banking applications for more than two years, which significantly indicates that most of the participants have a probable tendency to place relatively less weight on SENS_ RQMT and give no importance to RELATION_ RQMT.

Finally, we have observed significant positive indirect impacts of MONITOR, REACH, and REPRESENT on the CONT_USE mediated by PV. This means that the great MONITOR, REACH, and REPRESENT capabilities of mobile banking applications increase CONT_USE by increasing PV. It also observed significant negative indirect impacts of SENS_ RQMT on the CONT_USE mediated by PV. This means that the great SENS_RQMT declined CONT_USE by declining PV. This means that bank customers who pay greater attention to SENS_RQMT show a low perception toward the amenability of banking monetary transaction processes to be conducted virtually via the mobile banking application (i.e., PV) and thus decline their intention to continue using mobile banking applications.

IMPLICATIONS FOR THEORY AND PRACTICE

The current study's uniqueness lies in various aspects. First, the study focuses on the continuous use of mobile banking applications rather than acceptance or adoption as an under-investigated topic in mobile banking research so far (Carlos & Oliveira, 2017; Souiden et al., 2021; Susanto et al., 2016). Considering information systems as a broader research area, prior information systems literature reviews have confirmed the scarcity of literature regarding the continuous use of technology compared to technology acceptance and/or adoption (Ding, 2019; Franque et al., 2020; Rad et al., 2018; Yan et al., 2021). While the initial adoption is an important first step toward realizing an IS/IT's success (Venkatesh et al., 2011, 2016), the maximum and long-term viability, as well as maximizing the financial investment of IT/IS (herein, mobile banking applications) hinges on its continued use rather

than first-time use or initial experience (Souiden et al., 2021; Susanto et al., 2016). Second, the study enriches the diverse mobile banking literature as it relies on PVT as a steering theory of the investigation. Few previous studies have practically applied PVT in the context of mobile banking applications (Carlos & Oliveira, 2017; Souiden et al., 2021). Additionally, our study contributes to the mobile banking domain by assessing the effects of the anthropomorphism of the mobile banking application and the failure risk of conducting banking monetary transactions virtually. Generally, there is scarce empirical research in the mobile banking context that has investigated the impact of both constructs.

In the context of developing countries, the customers' use of mobile banking is not up to expectations(Baabdullah et al., 2019; Souiden et al., 2021). Previous research refers to banks in developing countries having a challenge to convince customers to use this innovative channel (Abdennebi, 2023; Souiden et al., 2021), particularly in Jordan (Abu-Taieh et al., 2022). Therefore, based on the study results, the research generates insights directly applicable to practitioners in the banking industry responsible for mobile banking services development to increase the use uptake of mobile banking application rates.

This research also has several practical contributions. Practitioners in the banking industry can identify innovative ways to improve their mobile applications by understanding the factors that influence PV and CONT_USE. The significant role of REPRESENT means that when the customer starts a banking transaction process, the mobile banking applications should facilitate the process by providing related information in a readable, understandable, and easy way. REPRESENT affects the mobile banking customer experience. Hence, more efforts should be made to enhance information visualization, for example, by using dashboards and shortcuts. Effective REPRESENT of information and monetary transaction steps affects the mobile banking customer experience. Hence, more efforts should be to enhance information visualization, for example by using dashboards and shortcuts. This could involve representing complex financial data and information visually using charts, graphs, diagrams, and interactive visual interfaces. Consequently, the financial information would be more understandable, and monetary transaction processes or steps would be more executable.

ANTHROPHISM significantly influenced bank customers' perceptions regarding the convenience of conducting banking monetary transactions with mobile applications. According to Accenture's recent global banking consumer study, customers' banking journeys have led to a significant number of interactions being functionally correct but lacking in the human touch, highlighting the need for banks to rekindle the human touch (Abbott et al., 2023). In order to retain customers, banks will need to keep up with the kinds of fast, personalized, and seamless digital experiences. Therefore, banks and the related technology industry vendors of financial applications are advised to embrace Artificial Intelligence (AI) technologies to enhance their customers' banking experience with anthropomorphic features such as voice synthesizers and Chatbots. The availability of anthropomorphic virtual assistants through mobile banking applications that mimic human looks and behave using multiple cues such as a human name, photorealistic human avatar, and verbal cues would create more emotional connections and enhance customer experience. This would enrich mobile banking applications with a greater human touch.

The significant impact of MONITOR suggests that banks should demonstrate the security of mobile applications. Several studies highlighted the security/privacy concerns as a major reason for conducting monetary transactions in bank branches over mobile banking applications (prefer branch banking over) (Merhi et al., 2019; Patel & Patel, 2018). Banks are highly recommended to use/apply (or keep using) various multi-adequate authentication tools and procedures (e.g., facial recognition-based biometric systems and deep-learning anti-spoofing with liveness detection) to detect unauthorized entry attempts and check suspicious financial movements. AI technologies can be quite effective when it comes to finding any fraudulent behavior and detecting suspicious transactions that can be blocked before they hit bank customers.

Finally, managing or minimizing the virtual process of FAILURE should be one of the bank's concerns. The applications of AI technologies could help users eliminate manual entries of banking transactions and services via automating transactions. The applications of AI technologies could also provide users with account analytics, predictive analysis, and automated advice. Banks are suggested to provide users with the necessary information on what they have to do when the process fails, along with effective assisted digital support. The research also recommends that banks set and publish clear rules and procedures in addition to promoting tolerance and guaranteeing customers' rights when the process fails if mistakes happen, which ultimately enhances customers' experience while using mobile banking applications.

The use of mobile banking applications is crucial, with the main goal of increasing customer satisfaction and strengthening loyalty. Thus, banks remain competitive, especially given the intense competition in the banking sector. The continuous use or post-adoption of mobile banking applications ultimately determines the success of online banking (Patel & Patel, 2018). Banks invest billions of dollars worldwide to develop and implement mobile applications. What is rational from this investment is that banks would only recoup costs based on continuous usage of mobile banking applications. Rationally, unless continuous usage, the mobile banking application does nothing or little for banks (Foroughi et al., 2019; Inan et al., 2023). This highlights the importance of continued usage for successful co-creation between the bank and its customers (Oertzen & Odekerken-Schröder, 2019).

CONCLUSION

The current study examines the factors influencing the continuous use of mobile banking applications as an under-investigated topic in mobile banking research, following a unique perspective suggested by PVT. The previous mobile banking empirical research suffers from several shortcomings, the most serious being the lack of diversification and prejudice toward using traditional IS/IT acceptance models (e.g., ECM, TAM, and UTAUT), which may result in producing studies that might be similar in content. The study has established the significant positive impact of process virtualizability and anthropomorphism, simultaneously with a negative significant impact of the virtual process failure risk, on shaping bank customers' decision to continue using mobile banking applications. The constructs of anthropomorphism and the virtual process failure risk factors have shown a significant direct impact on mobile banking's continuous use. This study is among the first attempts to recognize both constructs' impact on the CONT_USE of mobile applications.

The study results confirm the direct positive effect of the mobile banking application's monitor, reach, and representation capabilities on banking process virtualizability. The study apprises researchers and practitioners of the significant role of a set of such novel factors in shaping continuous usage behavior, which should be understood and fulfilled. Given that the research model explains as much as 67.5% of the variance of continuous use to a high degree of certainty, it could be useful for predicting continuous usage of mobile banking applications.

The current study reaches the primary conclusion that bank customers would be more motivated to continue using mobile banking applications as long as such applications continue to succeed in providing users a virtual environment for executing banking transactions similar/equivalent to the face-to-face environment that occurs in the bank's physical sites.

Banks are suggested to provide users with clear guidelines, steps, or tutorials on how to execute the bank transaction successfully, with customers' security and privacy concerns, by adopting effective multi-adequate authentication tools and procedures. Further, banks are recommended to design and implement AI mobile banking applications to have human-like appearances that could simulate human emotions and behavior. The adoption of AI-powered virtual bank assistants is recommended to effectively enable bank customers to complete various banking services easily and securely as if they were interacting with real people. This is expected to infuse humanity and personalization into their digital interactions, forge strong customer connections, and build trust. AI technologies can also be

quite effective in decreasing the failure risk by eliminating manual entries of banking transactions/services.

LIMITATIONS AND FUTURE RESEARCH

Although the study was carefully designed and executed, it has some limitations, many of which suggest opportunities for future research. The study was conducted with bank customers from one Middle Eastern country – Jordan. Hence, our findings might be influenced by the Jordanian national culture and social and economic circumstances. Since specific cultural differences may affect users' behavior toward post-adoption of technology, integrating and examining the effect of national cultural values or dimensions suggested by Hofstede (2001) in future models may provide other interesting insights. As per our sample, a majority of the study participants are from urban areas. Therefore, it is conceivable that users from rural areas may have different views/perspectives towards the continuous use of mobile banking applications. Future research is encouraged to focus on users living in rural areas. The study model does not consider psychological factors such as trust and satisfaction, which would provide further insights into the factors influencing continuous use. Although it could be argued that the current study has avoided the threat of the findings' validity since the study sample consisted of professional workers who may fully represent the population of banking users, it must be noted that our study sample mainly represents Millennials (current ages 26–41 years) and Gen X (current ages 42–57 years) more than the elderly (current ages older than 57).

Future research may consider a different approach targeting users' resistance, rejection, and non-adoption. In fact, PVT would be considerably useful in this aspect as it can explain why people might prefer physical processes over virtual processes. Finally, the research provides measurement items that were specifically designed based on PVT constructs for the context of mobile banking applications. Although the suggested items have shown an acceptable degree of validity and reliability, researchers are encouraged to reuse, test, and refine the currently developed measurement items or propose new items if necessary.

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