Research article

Understanding the factors of mobile payment continuance intention: empirical test in an African context

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HIGHLIGHTS

- Use, satisfaction and individual performance impact on continuance intention.
- Information quality affects use, satisfaction and confirmation.
- Use and satisfaction affect individual performance of m-payment.
- Information quality, use, confirmation & perceived usefulness affect satisfaction.

ARTICLE INFO

ABSTRACT

Few studies have been conducted about individuals' continuance to use m-payment, especially in an African context. This study investigates the continuance intention to use m-payment, employing two theoretical models: the DeLone and McLean information system (D&M IS) success model and the expectation-confirmation model (ECM) in an African context. We collected 338 questionnaires through an online survey to evaluate and validate the proposed theoretical model, using partial least squares – structural equation modelling (PLS-SEM). Our results indicate that the most important predictors of continuance intention to use m-payment are individual performance, use, and satisfaction. The results present useful insight to understand continuance intentions toward mobile payment in an African context. The integration of D&M IS success model, and the ECM model is to allow us to understand the main factors affecting the continuance intention to use mobile payment in the African context. By combining these two models we show how to compensate for and complement the weaknesses and strengths of the models, solidifying our findings of continuance intention with a stronger model that is otherwise not possible.

1. Introduction

In recent years the number of mobile phone users has been growing exponentially, motivating companies to deliver services via mobile phones (Karjaluoto et al., 2019; Persaud and Azhar, 2012; Wu et al., 2017). Mobile payment (m-payment) is one of the many services that can be used via mobile phones. M-payment is a imbursement method that uses mobile phones to make financial transactions such as paying for goods or services, transferring money, and withdrawing money (Fan et al., 2018; Zhou, 2013). M-payment technology was a disruptive revolution that affected payment ecosystems, originating in the United States and spreading throughout the world (Fan et al., 2018). In Africa, m-payment was launched in Kenya, and was quickly adopted in other countries. Mozambique is one of the African countries that adopted

m-payment, helping rural people who do not have banking infrastructure near them (Batista and Vicente, 2018). When we compare the usefulness of m-payment in developed and developing economies, it appears that the impact on people's lives is most noticeable in developing economies, considering that financial services do not reach most of the population yet, and most people travel long distances to access them (Asamoah et al., 2020; Humbani and Wiese, 2018; Iman, 2018). M-payment has a major impact on these communities because it provides basic financial services such as money transfer, payment of goods and services, and/or withdrawing money, thereby improving people's lives (Iman, 2018; Rahman et al., 2020).

Much research has been undertaken to understand m-payment in different contexts (e.g., Lu et al. (2017) in China; Lin et al. (2017) in the United States; Sinha et al. (2019) in India; Oliveira et al. (2016) in

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Portugal). However, few studies have been conducted in the African context (Chen and Li, 2017; Lin et al., 2017). Previous literature has used different theoretical models to understand continuance intention to use m-payment. Shao et al. (2019) used trust and innovation diffusion theory; Lu et al. (2017) used expectation-confirmation theory, mobility, privacy protection, social influence, and cultural values; Chen and Li (2017) used IT continuance, risk-trust, and affect-cognition literature. With the exception of two studies that integrated quality factors to understand continuance intention of m-payment (Zhou, 2013, 2014), our study shows how important it is to combine DeLone and McLean information system (D&M IS) success model, and expectation-confirmation model (ECM). Each model has strengths and weaknesses, and these are offset and complemented by combining these two models. Despite the benefits of m-payment, there are still barriers to the continuance use. Many users remain concerned about individual performance and the quality of services, since the m-payment service involves transaction information that affects user privacy. It is important that the users feel confident about m-payment, realize that the service is of quality, that it contains useful information and that they feel the need to use more and more.

Earlier studies addressed similar issues (Fan et al., 2018; Shao et al., 2019; Zhou, 2011, 2013), but did not integrate a model that can explain different qualities of m-payment, satisfaction, and perceived individual performance to understand continuance intention of m-payment. Considering the impact of m-payment in the African context, due to the lack of access to technology in the same proportion, a service that can be used anytime and anywhere, regardless of the education and economic level, reducing the need to use banks is of great importance (Pal et al., 2020). The context can challenge the theoretical models to explain m-payment. Based on these reasons, we approached the research question (RQ): How do the individual performance drivers influence the continuance intention to use m–payment in an African context? In this sense, it is in our interest to understand the effects of individual performance drivers combined with the ECM on m-payment. We joined two well-established models, the D&M IS success model (DeLone and Mclean, 2003) and ECM (Bhattacherjee, 2001) to investigate continuance intention to use m-payment and gain a holistic view of the quality of service and individual performance on continuance intention.

The current research contributes to the literature firstly by combining the D&M IS success model with the ECM model with the aim of improving the understanding of continuance intention to use m–payment, identifying important determinants. As per previous research, this would be the first study to combine all the factors of D&M IS success model and ECM model with the purpose to understand continuance intention to use m–payment. Secondly, considering that the African market is developing, this research will benefit people and companies that are developing IT related to m-payment by identifying the most important factors that can lead to end-user's long-term usage. Thirdly, by addressing the factors of individual's continuance intention to use m-payment, the study deepens knowledge, about what is important to the long–term usage of an IS (Bhattacherjee, 2001).

The next section presents the bibliographic review. Section 3 outlines the hypotheses and the research model. Section 4 describes the research methodology. Data analyses and results of research are presented in Section 5. Finally, the discussion and conclusions are detailed in Sections 6 and 7, respectively.

2. Literature review

2.1. Mobile payment

M-payment is a type of payment that can be performed by mobile devices (such as mobile phones, smartphones, etc.), to pay for goods, services, and bills. They use wireless technologies (mobile phone networks, NFI, Bluetooth, RFID, etc.) to perform transactions (Kaur et al., 2020; Kujala et al., 2017; Liébana-cabanillas et al., 2014; 2018;

Liébana-Cabanillas and Lara-Rubio, 2017; Park et al., 2019). Other authors refer to m-payment as a service to carry out payment, check balances, and transfer money in a simple way, anytime and anywhere (Pal et al., 2020; Zhou, 2013, 2014). There are different ways to conduct a transaction using m-payment, the simplest is based on using short-messages with a simple mobile phone whereby the user can check balances or conduct payments using short messages (de Luna et al., 2019; Zhou, 2013). Another method is by using NFC (near field communication), communication is established by the proximity of two devices, and the transaction is made (de Luna et al., 2019; Kujala et al., 2017; Liébana-Cabanillas et al., 2019). The most sophisticated means is by using a mobile application (app), the user downloads the app, installs it on a smartphone, and registers to start using the app (Singh et al., 2020; Verkijika, 2020).

M-payment continuance intention was studied by Lu et al. (2017), who applied mobility, privacy protection, and social influence, and concluded that post-usage privacy protection and social influence belief impact users' intentions to continue using m-payment. Yu et al. (2018) applied trust transfer theory, perceived similarity, and entitativity, and determined that satisfaction is an important predictor influencing m-payment continuance intention, and that the trust transfer process positively influences continuance intention through satisfaction. Zhou (2013) used information systems success and flow theory, and posited that flow, satisfaction, and trust influence continuance intention; and m-payment providers need to offer a quality system, information, and service to guarantee long-term usage. Chen and Li (2017) applied IT continuance, risk-trust, and affect-cognition, and concluded that satisfaction and postadoption perceived usefulness positively influence continuance intention of m-payment. In general, most previous studies focused on trust and satisfaction of the m-payment continuance intention (Lu et al., 2017; Tam et al., 2020; Zhou, 2012, 2014), but quality and performance also play an important role in m-payment continuance usage.

2.2. Mobile payment in an African context

In an African context, telecommunication companies (Safaricom) launched m-payment (M-Pesa) in Kenya in 2007 (Jack and Suri, 2011; Wenner et al., 2018). Kenyans consolidated the usefulness of this technology (Omigie et al., 2017; Uwamariya and Loebbecke, 2020). The technology then grew exponentially and spread across the continent, and is now being used in more than five African countries and has more than 29 million active users (Vodafone Group, 2016; Wenner et al., 2018).

M-payment was adopted in Mozambique and grew rapidly, considering that this service is an alternative to bank-based systems for the population to access financial services. Using simple short messages, users can perform a transaction to transfer money, and pay for goods and services. This service was introduced by the Mozambican Telecommunication Company MCel (mKesh) and by Vodacom (M-Pesa) (Ortigão et al., 2015). Batista and Vicente (2018) found that m-payment is very important in rural areas to increase financial inclusion. Jack and Suri (2011) argued that m-payment spread very quickly because it is an alternative banking service and has substantial impact on people in low economic conditions. Tobbin and Kuwornu (2011) argued that perceived ease of use and perceived usefulness are the most important factors of behavioural intention to use m-payment in Ghana. Humbani and Wiese (2018) show that convenience and compatibility positively influence the adoption of m-payment. Additionally, they demonstrated that only gender could moderate the relationship between convenience and the adoption of m-payment.

2.3. Theoretical models

2.3.1. DeLone and McLean IS success model

The DeLone and McLean IS success model has been broadly used to explain individual and organizational performance (DeLone and McLean,

1992). However, in this study, the focus is on the individual level. The D&M IS model explains that (1) both quality system and information quality significantly influence the use of IS and user satisfaction, (2) the use of IS influences the user's satisfaction and vice versa, (3) both use and satisfaction significantly influence individual performance, and (4) individual performance significantly influences organizational impact. Several studies confirm that this model is powerful to explain individual performance and can be used with other models or variables (Baabdullah et al., 2019; Sharma and Sharma, 2019). Tam and Oliveira (2016) employed it to understand the impact of mobile banking; Hsu et al. (2014) used the model to explain the repurchase intention on online group-buying; Wang (2008) applied it to explain the impact of e-commerce system success.

After ten years DeLone and Mclean (2003) reviewed several papers that validate, challenge, and propose improvements to the original model, and proposed an updated model. In the updated model they include the fact that service quality significantly influences the use of the system and satisfaction. They realized that with the growth of IS, users started paying attention to the quality of services (Tam and Oliveira, 2016). Concerning the impact, in the updated model, they realized that other studies have proposed several types of impacts and decided to join all the impacts into a single impact called net benefits. Considering that the proposed model is based on the individual level, the individual performance will also be used.

2.3.2. Information system continuance model

There are several theories used in studies related to information systems, such as the unified theory of acceptance and usage of technology (UTAUT), the technology acceptance model (TAM), and the task-technology fit (TTF). Our interest is based on the post-adoption theoretical model of IS, at the individual level. There is a difference between adoption and continuance intention of IS. Adoption refers to factors that explain why an individual adopts or rejects a technology (Humbani and Wiese, 2019; Straub, 2009). At this stage, the users have their first contact with the technology, and depending on their experience, they decide whether to use it or to reject it. Continuance intention refers to factors that explain why an individual uses a technology for a long time, thus contributing to the continued use of the technology (Franque et al., 2020; Lin et al., 2017). It involves understanding the long-term factors that contribute to the success of the IS (Bhattacherjee, 2001; Lin et al., 2017).

Despite the merit of previous studies that applied adoption theories such as UTAUT and TAM to explain continuance intention (Hadji and Degoulet, 2016; Joo et al., 2016; Wu and Chen, 2017), the application of these models may suffer from some limitations, leading to misunderstandings and misapplications of these theories (Bhattacherjee and Barfar, 2011; Franque et al., 2020; Nabavi et al., 2016). The ECM model was based on the expectation-confirmation theory of Oliver (1986). The model explains that (1) continuance intention to use IS was strongly anticipated by user satisfaction, followed by users' perceived usefulness of the system, (2) user satisfaction was predicted by users' confirmation of perceived usefulness and expectation, and (3) user confirmation of expectation was a significant predictor of users' perceived usefulness. The model was extensively tested in IS research and confirmed to be a good model to explain continuance intention (Carillo et al., 2017; Ryu, 2018; Talwar et al., 2020; Wang et al., 2019; Zheng, 2019). Users' satisfaction is the best factor to improve the continuance intention-behaviour to use IS, and before users decide to continue using, satisfaction and positive attitude are essential (Bhattacherjee, 2001).

Most research on IS continuance intention was based on the ECM model. Shiau et al. (2020) used it to explain fintech; Susanto et al. (2016) used it to explain smartphone banking services; Lee (2010) applied it to explain e-learning; Alraimi et al. (2015) utilized it to explain MOOCs; and Gao et al. (2015) used the model to explain mobile purchase. To the best of our knowledge, ECM and the D&M IS success model have users' satisfaction as the strongest factor of individual performance and continuance intention.

2.3.3. Joint model of D&M IS success and ECM

The model proposed is based on ECM (Bhattacherjee, 2001). Bhattacherjee asserted that the model provides a better contribution to continuance intention to use IS. As can be seen in the literature, some studies guided their research based on ECM (Shiau et al., 2020; Susanto et al., 2016). The ECM model focuses on three cognitive feelings (satisfaction, perceived usefulness, and expectation of confirmation). However, it does not include other constructs that may express additional feelings, such as quality of service, performance, and usage, among others. To address this absence, different studies integrated others models and factors to explain different phenomena (Gao et al., 2015; Humbani and Wiese, 2019; Wu and Chen, 2017). Based on the suggestions of Bhattacherjee (2001) and Bhattacherjee and Lin (2014), that their models should be considered in different environments and technologies, and with other factors, the present study combines D&M IS success model and ECM to understand m-payment.

3. Research model and hypotheses

The aim of this study is to understand continuance intention of m-payment, using the post-acceptance model ECM, which states that satisfaction and perceived usefulness are the main factors supported by the confirmation of expectations (Bhattacherjee, 2001). The addition of other models or constructs will provide a better understanding of the long-term usage of m-payment. Thus, we integrated the D&M IS success model that asserts that the quality of services, system, and information predict satisfaction and use, which consequently influence individual performance. Thus, the theoretical model proposed (Figure 1) to understand continuance intention to use m-payment states that:

1. The quality of service, system, and information determine confirmation, satisfaction, and use of m-payment.
2. Confirmation of expectation directly influences satisfaction and perceived usefulness of m-payment.
3. The use directly determines satisfaction, individual performance, and continuance intention.
4. Satisfaction directly influences individual performance and continuance intention.
5. Perceived usefulness directly influences satisfaction and continuance intention.
6. Individual performance directly determines continuance intention.

The corresponding hypotheses are discussed below.

Information quality reflects the relevance, sufficiency, precision, and punctuality of information. However, users start and continue using m-payment when they find relevant, accurate, and up-to-date information. Information quality may also influence users' satisfaction (Cidral et al., 2018). In contrast, poor information quality can decrease users' satisfaction as they expect to obtain reliable, relevant, and timely information from m-payment systems (Gao et al., 2015). When users start using IS, they have initial expectations, and during the acceptance process, the level of expectation increases or decreases. However, information quality may positively influence the confirmation of expectation. For Tam and Oliveira (2016) information quality plays an important role in explaining user satisfaction of using mobile banking. Zhang et al. (2017) report that high information quality content improves the user satisfaction of virtual learning community services.

H1a. The quality of the information positively influences the use of m-payment.

H1b. The quality of the information positively influences the user satisfaction of m-payment.

H1c. The quality of the information positively influences the confirmation of m-payment.
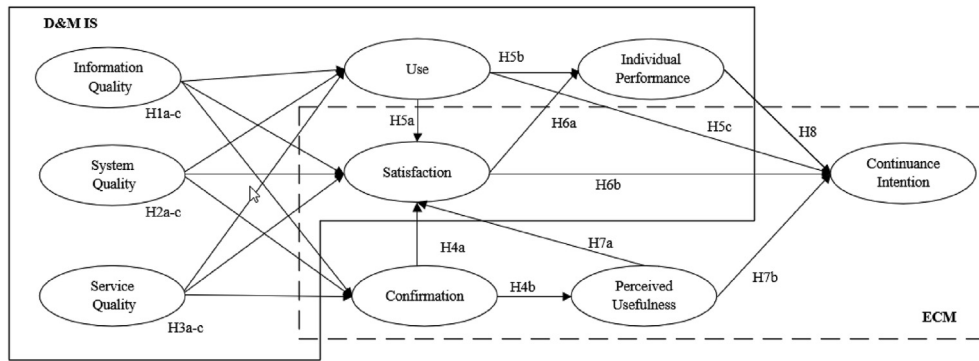
Figure 1. Research model. Notes: ECM: Expectation Confirmation Model; D&M IS: DeLone and McLean information system success.

DeLone and McLean (1992) introduced system quality, presenting it as the overall quality performance of the system, and that it is measured by the perceptions of the individual. System quality represents access speed, good connection, navigation, and ease of use (Cidral et al., 2018; Gao et al., 2015). The m-payment service provider that accommodates the above characteristics and users' perceived quality of the system may increase the level of expectation, easing the use of m-payment services. Furthermore, system quality may improve the use and user satisfaction of m-payment. Confirming users' initial expectations may influence long-term usage of m-payment.

H2a. System quality positively influences the use of m-payment.
H2b. System quality positively influences user satisfaction of m-payment.
H2c. System quality positively influences confirmation of m-payment.

Service quality reflects assurance, personalization, reliability, and responsiveness. This means that when users perceive reliable service, and when the m-payment service provider is always willing to support users when needed, user expectations will be confirmed, and they will continue using the system (Tam and Oliveira, 2016). The m-payment service provider must ensure quality of the service to increase the users' satisfaction and the trustworthiness of the service, and consequently continuance use of m-payment (Gao et al., 2015). In the acceptance process, positive expectations help users to adopt the IS. Therefore, service quality plays a crucial role to confirm user expectations.

H3a. Service quality positively influences the use of m-payment.
H3b. Service quality positively influences the user satisfaction of m-payment.
H3c. Service quality positively influences the confirmation of m-payment.

Confirmation refers to users' assessment toward a product, service, or technology. Users make their assessment when comparing their initial expectations with the performance of the product, service, or technology. When they achieve their initial expectations, they have positive confirmation; when the initial expectations are not achieved, they have negative confirmation (Alraimi et al., 2015; Oghuma et al., 2016). Confirmation of expectation in m-payment services usage will increase the satisfaction of the users and the perceived usefulness of the service (Susanto et al., 2016).

H4a. Confirmation positively influences user satisfaction of m-payment.
H4b. Confirmation positively influences perceived usefulness of m-payment.

The use of m-payment service begins to be frequent when users perceive dependence of the service or system, when they perceive no effort to use it, and when they start perceiving performance outcomes (Chang et al., 2014). When the use of m-payment services starts to become automatic, and users use it frequently, and they start perceiving the individual performance of the service or system, satisfaction increases.

H5a. The use of m-payment positively influences the satisfaction of users.
H5b. The use of m-payment positively influences the individual performance of users.
H5c. The use of m-payment positively influences users' continuance intention.

Satisfaction reflects comfortable feelings by an individual using m-payment services, because of the usage experiences and performance outcomes, meaning that satisfaction starts to become stronger after users adopt the service or system (Bhattacherjee and Lin, 2014). When users are satisfied with the service, the long-term relationships become stronger (Yu et al., 2018). Many papers confirm that satisfaction is the best predictor to improve the continuance intention of any system and to motivate users to perceive the individual performance of the service or system (Carillo et al., 2017; Cho, 2016; Mouakket, 2015; Yu et al., 2018).

H6a. User satisfaction positively influences the individual performance of m-payment.
H6b. User satisfaction positively influences the continuance intention to use m-payment.

Perceived usefulness is the degree to which individuals start to understand the advantages in terms of usage of the IS (Davis, 1989). This means that when users perceive the benefits of the service or system utilization, the long-term relationship is reinforced (Lee, 2010; Rezvani et al., 2017). Perceived usefulness is very important for m-payment because users perceive the benefits, and the utilization of the system becomes more frequent. Perceived usefulness strongly influences continuance intention to use m-payment services. Earlier research shows that perceived usefulness is very important to satisfaction and increases the intention to continue using IS (Cho, 2016; Joo et al., 2018; Shin et al., 2017).

H7a. Perceived usefulness positively influences user satisfaction of m-payment.
H7b. Perceived usefulness positively influences continuance intention to use m-payment.

Individual performance is the degree to which an individual perceives that IS enables him or her to accomplish tasks more easily and quickly (DeLone and Mclean, 2003). It suggests that individuals use IS if they

perceive that it is useful to their activities (Tam and Oliveira, 2016). Individual performance reinforces the behaviour to continue using an m-payment system because it can be used anytime and anywhere. It the model proposed, individual performance has an important influence on continuance intention, and consequently impacts continuance intention to use m-payment.

H8. Individual performance positively influences continuance intention to use m-payment.

4. Methodology

4.1. Measurement

As mentioned in the sections above, a theoretical model was used to investigate continuance intention of m-payment. The main method of data collection for this study was an online survey, as it is the quickest and most effective way to collect responses on this subject (Alraimi et al., 2015; Chang and Zhu, 2012). A questionnaire was developed for the survey using constructs and items from the literature (Table 1). The items measured for information quality, system quality, service quality, and individual performance were adopted from Tam and Oliveira (2016); the items for use were adopted from Venkatesh et al. (2003); the items for satisfaction, confirmation, perceived usefulness, and continuance intention were adopted from Bhattacherjee (2001). The questionnaire was approved by the NOVA IMS Ethics Committee.

4.2. Data

Data were collected from June 2018 to October 2018. The items were assessed on a seven-point scale, ranging from one (totally disagree) to seven (totally agree). The question was created and managed in English and revised for content validity by a language expert. Nevertheless, a professional translator translated the questionnaire into Portuguese to adjust it to the Mozambican context. The questionnaire was reverse translated to English by a different translator to ensure equivalence (Brislin, 1970). To validate the instruments, a pilot test was conducted on a group of 40 students, who were excluded from the main sample. Given that the goal of this study is to investigate continuance intention to use m-payment, the target respondents should have experience in using m-payment. To ensure this, the valid respondents in the Mozambican context were confined to M-Pesa and Mkesh users. The survey was sent to the respondents, providing a hyperlink for the questionnaire. We received 338 valid responses by the end of October 2018 from the 900 e-mails sent, which corresponds to a 37.5% response rate. We tested the sample distributed to the first and second respondent groups using the Kolmogorov-Smirnov (K-S) test and confirmed that they do not differ statistically (Ryans, 1974), showing that non-response bias was not present. The common method bias was also examined using Harman's test (Podsakoff et al., 2003) confirming no significant common method bias in the data.

The characteristics of the sample are shown in Table 2; 60% of the respondents were men, 42% of the respondents had used m-payment one (1) to four (4) times during the last 3 months.

5. Data analysis and results

Structural equation modeling (SEM) with partial least square (PLS) was used to test and assess the validity of the theoretical model. Previous research has recognized the potential of SEM for measuring structural models (Alraimi et al., 2015; Tam and Oliveira, 2016). SEM is a set of statistical models used to assess the validity of theories with empirical data (Ringle et al., 2005). Additionally, the Kolmogorov–Smirnov (K-S test) was implemented, as it is used in cases where data are not usually distributed, and the research model is complex and has not been tested in the literature. Thus, PLS is the appropriate method for this research.

Table 1. Measurement items.

Nº	Constructs	Questionnaire Items	Adapted from
1	Information Quality (INFQ)	INFQ1. The information provided by M-Payment is useful. INFQ2. The information provided by M-Payment is understandable. INFQ3. The information provided by M-Payment is interesting. INFQ4. The information provided by M-Payment is reliable.	Tam and Oliveira (2016)
2	System Quality (SYSQ)	SYSQ1. M-Payment is easy to navigate. SYSQ2. M-Payment allows me to easily find the information I am looking for. SYSQ3. M-Payment is well structured. SYSQ4. M-Payment is easy to use.	Tam and Oliveira (2016)
3	Service Quality (SERQ)	SERQ1. The responsible service personnel are always highly willing to help whenever I need support with the M-Payment. SERQ2. The responsible service personnel provide personal attention when I experience problems with the M-Payment. SERQ3. The responsible service personnel provide services related to M-Payment at the promised time. SERQ4. The responsible service personnel have enough knowledge to answer my questions with respect to M-Payment.	Tam and Oliveira (2016)
4	Use (U)	U1. I use M-Payment. U2. I use M-Payment to buy products and services. U3. I use M-Payment to make transfers. U4. I use M-Payment to withdraw money.	Venkatesh et al. (2003)
5	Satisfaction (S)	S1. I am very pleased to use M-Payment. S2. I am very happy with M-Payment. S3. I am delighted with M-Payment.	Bhattacherjee (2001)
6	Confirmation (C)	C1. My experience with using M-Payment was better than I expected. C2. The service level provided by M-Payment was better than I expected. C3. Overall, most of my expectations from using M-Payment were confirmed.	Bhattacherjee (2001)
7	Perceived Usefulness (PU)	PU1. Using M-Payment improves my performance. PU2. Using M-Payment increases my productivity. PU3. Using M-Payment enhances my effectiveness. PU4. I find M-Payment to be useful for my work.	Bhattacherjee (2001)
8	Individual Performance (IP)	IP1: M-Payment enables me to accomplish tasks more quickly. IP2: M-Payment makes it easier to accomplish tasks. IP3: M-Payment is useful for my job.	Tam and Oliveira (2016)
9	Continuance Intention (CI)	CI1. I intend to continue using M-Payment rather than discontinue its use. CI2. My intentions are to continue using M-Payment rather than manual processing or other alternative means. CI3. I plan to continue using M-Payment in my job.	Bhattacherjee (2001)

Table 2. Sample characteristics.

Age		
<25	119	35%
25 - 30	96	28%
31 - 40	76	22%
41 - 50	38	11%
>50	9	3%
Gender		
Female	134	40%
Male	204	60%
Education		
High school or below	83	25%
Bachelor's degree	151	45%
Master's degree or higher	104	31%
Employment		
Students	95	28%
Working professionals	203	60%
Retired	1	0%
Unemployed	39	12%
Marital status		
Single	162	48%
Married	74	22%
Divorced	23	7%
Widowed	10	3%
Common-law marriage (cohabitation)	67	20%
Do not know answers	2	1%
M-payment usage frequency (time/3 months)		
1 - 4	143	42%
5 - 10	92	27%
>10	103	30%

Smart PLS 3 software (Ringle et al., 2015) was used to analyse the theoretical model relationships.

5.1. Measurement model

The results of the measurement model are presented in Tables 3 and 4. The results of composite reliability (CR) are greater than 0.70, indicating that the model has good internal consistency. To assess the indicator reliability, we considered a loading greater than 0.70. The instruments present a good indicator reliability. Average variance extracted (AVE) was used to test convergent validity. AVE should be greater than 0.50 so that the latent variables explain more than half of the variance of their indicators (Fornell and Larcker, 1981; Hair et al., 2016; Henseler et al., 2009).

As seen in Table 3, all the constructs meet these criteria, ensuring convergence. This shows that the constructs can be used to assess the theoretical model. Discriminant validity was measured using Fornell-Larcker criterion (Table 4), cross-loadings criterion (Table 5), and the heterotrait-monotrait ratio of correlations (HTMT) (Table 6). Table 4 reports the square root of the AVE in bold along the diagonal, and the correlations between the constructs. Based on Fornell and Larcker (1981) criterion, the square root of the AVE should be greater than the correlation between the constructs, and thus the constructs fulfil the criterion. To ensure the discriminant validity, each item presents a higher loading on its corresponding factor than in the cross-loading (Chinn, 1998; Götz et al., 2010). Based on HTMT (Table 6) it can be seen that all the values are below 0.90, and it therefore can be concluded that there is discriminant validity (Henseler et al., 2015). The measurement model findings indicate that the model has a good internal consistency, reliability indicator, convergence validity, and discriminant validity, illustrating that the constructs are statistically different and can be used to assess the structural model.

5.2. Structural model

After the validation of the measurement model, the structural model was analysed for hypotheses and constructs testing. Figure 2 presents the research results. The structural model assessment used 5000 bootstrap resamples to estimate the path significance level of the model (Henseler et al., 2009). The VIF (variance inflation factor) was also tested to assess the multicollinearity. All of the constructs are below the threshold of 5, indicating the absence of multicollinearity between the constructs (Hair et al., 2016).

The model explains 32% of the variation in the use of m-payment. The information quality ($\hat{\beta} = 0.400$, p < 0.01) and service quality ($\hat{\beta} = 0.225$, p < 0.01) are statistically significant in explaining use, thus confirming H1a and H3a. The system quality is not statistically significant in explaining use, and thus hypothesis H2a is not confirmed.

The model explains 53% of the variation in satisfaction in using m-payment. The information quality ($\hat{\beta} = 0.152$, p < 0.01), confirmation ($\hat{\beta} = 0.389$, p < 0.01), use ($\hat{\beta} = 0.240$, p < 0.01), and perceived usefulness ($\hat{\beta} = 0.136$, p < 0.05) are statistically significant in explaining satisfaction, thus confirming H1b, H4a, H5a, and H7a. System quality and service quality are not statistically significant in explaining satisfaction, and thus hypotheses H2b and H3b are not confirmed.

The model explains 34% of the variation in confirmation of m-payment. Information quality ($\hat{\beta} = 0.359$, p < 0.01) and service quality ($\hat{\beta} = 0.275$, p < 0.01) are statistically significant in explaining confirmation, thus confirming H1c and H3c. System quality is not statistically significant, and thus hypothesis H2c is not confirmed.

The model explains 32% of variation in perceived usefulness of m-payment. Confirmation ($\hat{\beta} = 0.566$, p < 0.01) is statistically significant in explaining perceived usefulness, thus confirming H4b.

The model explains 19% of variation in individual performance. Use ($\hat{\beta} = 0.416$, p < 0.01) and satisfaction ($\hat{\beta} = 0.146$, p < 0.1) are statistically significant in explaining individual performance, therefore confirming H5b and H6a.

36% of the variation is explained by the model in continuance intention to use m-payment. Use ($\hat{\beta} = 0.272$, p < 0.01), individual performance ($\hat{\beta} = 0.310$, p < 0.01), and satisfaction ($\hat{\beta} = 0.270$, p < 0.01) are statistically significant in explaining continuance intention, therefore confirming H5c, H6b, and H8. Perceived usefulness is not statistically significant, and thus hypothesis H7b is not confirmed.

The strongest relationships were confirmation on perceived usefulness ($\hat{\beta} = 0.566$), use on individual performance (= 0.416), information quality on use (= 0.400), and confirmation on satisfaction ($\hat{\beta} = 0.389$).

6. Discussion

The model proposed is a combination of the D&M IS success model (DeLone and Mclean, 2003) and the ECM (Bhattacherjee, 2001), to explain continuance intention to use m-payment. Based on the findings (see Table 7), of 19 hypotheses 14 were confirmed and 5 were not. Therefore, we can argue that most of the hypothesized relationships were confirmed. Individual performance is the strongest predictor of continuance intention, followed by use and satisfaction. Information quality and service quality determine confirmation. Information quality, use, confirmation, and perceived usefulness determine users' satisfaction. Use is explained by information and service quality. Individual performance is explained by use and satisfaction of m-payment. Perceived usefulness is explained by confirmation. Surprisingly, service quality does not explain satisfaction, perceived usefulness does not explain continuance intention, and system quality explains none of the proposed relationships.

The results indicate that information quality positively influences use (H1a), satisfaction (H1b), and confirmation (H1c) of m-payment. The results of H1a and H1b are consistent with those of Tam and Oliveira (2016) and Cidral et al. (2018), who assert that information quality

Table 3. Measurement model.

Construct	AVE	Composite Reliability	Cronbach's Alpha	Item	Loadings	t-value
Information Quality (INFQ)	0.652	0.882	0.822	INFQ1	0.829	38.958
				INFQ2	0.851	44.922
				INFQ3	0.809	40.380
				INFQ4	0.737	17.910
System Quality (SYSQ)	0.628	0.871	0.801	SYSQ1	0.736	17.964
				SYSQ2	0.839	32.255
				SYSQ3	0.837	42.697
				SYSQ4	0.753	20.061
Service Quality (SERQ)	0.617	0.865	0.792	SERQ1	0.725	15.049
				SERQ2	0.824	30.969
				SERQ3	0.818	31.505
				SERQ4	0.771	23.059
Use (U)	0.595	0.855	0.773	U1	0.781	27.522
				U2	0.745	21.760
				U3	0.792	22.677
				U4	0.767	23.880
Satisfaction (S)	0.690	0.870	0.776	S1	0.850	48.015
				S2	0.833	40.310
				S3	0.809	27.531
Confirmation (C)	0.623	0.832	0.697	C1	0.777	21.874
				C2	0.824	32.682
				C3	0.765	24.587
Individual performance (IP)	0.630	0.836	0.705	IP1	0.782	27.527
				IP2	0.846	39.725
				IP3	0.751	18.229
Perceived Usefulness (PU)	0.575	0.844	0.753	PU1	0.729	17.764
				PU2	0.813	35.602
				PU3	0.778	25.344
				PU4	0.709	15.089
Continuance Intention (CI)	0.525	0.812	0.695	CI1	0.757	22.151
				CI2	0.769	20.020
				CI3	0.807	41.005

Note: AVE: Average variance extracted.

Table 4. Latent construct correlations and square roots of AVEs.

	Mean	STDEV	INFQ	SYSQ	SERQ	U	S	C	IP	PU	CI
INFQ	4.869	1.123	**0.807**								
SYSQ	4.813	1.123	0.608	**0.793**							
SERQ	4.247	1.166	0.247	0.284	**0.785**						
U	4.693	1.154	0.509	0.395	0.349	**0.771**					
S	4.464	1.165	0.524	0.432	0.361	0.566	**0.831**				
C	4.330	1.102	0.498	0.413	0.396	0.510	0.640	**0.789**			
IP	4.545	1.055	0.384	0.390	0.257	0.415	0.333	0.397	**0.794**		
PU	4.464	1.085	0.446	0.327	0.329	0.495	0.530	0.566	0.485	**0.758**	
CI	4.481	0.986	0.389	0.342	0.288	0.496	0.426	0.439	0.481	0.386	**0.724**

Notes: Values in bold are the square root of the average variance extracted; STDEV: Standard deviation; INFQ: Information Quality; SYSQ: System Quality; SERQ: Service Quality; U: Use; S: Satisfaction; C: Confirmation; IP: Individual performance; PU: Perceived Usefulness; CI: Continuance Intention.

positively influences use and satisfaction. This means that when m-payment provides information with quality, it positively impacts the usage, satisfaction, and confirmation of the expectation of m-payment (Chang et al., 2014; Cheng, 2014; Cidral et al., 2018). The users may always expect to access comprehensive, accurate, and up-to-date information on the m-payment system. As users understand that the m-payment presents quality information, they will understand that the m-payment provider is maintaining the information up to date, and they will therefore continue using m-payment. If the information is out of date or inaccurate, it will

negatively influence the usage, satisfaction, and expectations (Gao et al., 2015).

Our results indicate that system quality did not affect use (H2a), satisfaction (H2b), or confirmation (H2c) of m-payment, indicating that in the post-acceptance phase the quality of the system is not important for the usage, user satisfaction, or the confirmation of the expectations regarding continuance intention of m-payment. This result is not consistent with the findings reported in several studies (Budiardjo et al., 2017; Cidral et al., 2018; Gao et al., 2015). A possible explanation may

Table 5. Cross loadings.

	INFQ	SYSQ	SERQ	U	S	C	IP	PU	CI
INFQ1	**0.829**	0.427	0.185	0.476	0.461	0.428	0.359	0.411	0.329
INFQ2	**0.851**	0.541	0.166	0.440	0.440	0.385	0.364	0.369	0.354
INFQ3	**0.809**	0.516	0.222	0.379	0.434	0.420	0.312	0.408	0.327
INFQ4	**0.737**	0.490	0.234	0.334	0.346	0.371	0.183	0.231	0.235
SYSQ1	0.469	**0.736**	0.230	0.314	0.328	0.277	0.269	0.199	0.198
SYSQ2	0.477	**0.839**	0.255	0.306	0.385	0.339	0.326	0.264	0.293
SYSQ3	0.483	**0.837**	0.242	0.302	0.360	0.343	0.332	0.321	0.312
SYSQ4	0.499	**0.753**	0.171	0.332	0.293	0.346	0.306	0.247	0.277
SERQ1	0.245	0.278	**0.725**	0.251	0.289	0.319	0.174	0.275	0.216
SERQ2	0.172	0.208	**0.824**	0.295	0.283	0.331	0.229	0.271	0.265
SERQ3	0.176	0.168	**0.818**	0.282	0.287	0.297	0.170	0.232	0.195
SERQ4	0.183	0.239	**0.771**	0.268	0.275	0.296	0.235	0.253	0.226
U1	0.426	0.325	0.316	**0.781**	0.402	0.357	0.346	0.353	0.438
U2	0.386	0.292	0.219	**0.745**	0.406	0.381	0.308	0.421	0.425
U3	0.354	0.248	0.255	**0.792**	0.436	0.408	0.308	0.337	0.318
U4	0.400	0.346	0.282	**0.767**	0.498	0.426	0.316	0.414	0.349
S1	0.495	0.415	0.332	0.585	**0.850**	0.502	0.315	0.445	0.368
S2	0.432	0.348	0.267	0.435	**0.833**	0.545	0.259	0.469	0.367
S3	0.372	0.307	0.299	0.378	**0.809**	0.552	0.252	0.407	0.325
C1	0.341	0.294	0.294	0.402	0.561	**0.777**	0.352	0.456	0.341
C2	0.446	0.369	0.349	0.417	0.497	**0.824**	0.341	0.456	0.375
C3	0.390	0.312	0.294	0.387	0.454	**0.765**	0.241	0.426	0.321
IP1	0.309	0.286	0.234	0.356	0.318	0.354	**0.782**	0.369	0.389
IP2	0.295	0.333	0.181	0.330	0.249	0.278	**0.846**	0.375	0.403
IP3	0.312	0.309	0.198	0.301	0.223	0.314	**0.751**	0.414	0.351
PU1	0.388	0.227	0.230	0.347	0.420	0.468	0.322	**0.729**	0.249
PU2	0.323	0.234	0.260	0.410	0.375	0.466	0.380	**0.813**	0.325
PU3	0.312	0.283	0.275	0.344	0.431	0.395	0.395	**0.778**	0.335
PU4	0.333	0.252	0.230	0.402	0.386	0.381	0.377	**0.709**	0.258
CI1	0.310	0.261	0.231	0.389	0.312	0.339	0.380	0.337	**0.757**
CI2	0.276	0.271	0.175	0.367	0.334	0.317	0.319	0.274	**0.769**
CI3	0.359	0.316	0.248	0.431	0.373	0.364	0.462	0.296	**0.807**

Notes: Indicator loading (in bold) greater than all its cross-loadings; INFQ: Information Quality; SYSQ: System Quality; SERQ: Service Quality; U: Use; S: Satisfaction; C: Confirmation; IP: Individual performance; PU: Perceived Usefulness; CI: Continuance Intention.

Table 6. Heterotrait-monotrait ratio of correlations (HTMT).

	INFQ	SYSQ	SERQ	U	S	C	IP	PU	CI
INFQ									
SYSQ	0.755								
SERQ	0.311	0.357							
U	0.631	0.500	0.444						
S	0.648	0.544	0.460	0.721					
C	0.657	0.551	0.533	0.694	0.871				
IP	0.497	0.519	0.345	0.561	0.447	0.564			
PU	0.561	0.422	0.426	0.650	0.695	0.778	0.670		
CI	0.487	0.433	0.386	0.658	0.563	0.623	0.656	0.527	

Notes: INFQ: Information Quality; SYSQ: System Quality; SERQ: Service Quality; U: Use; S: Satisfaction; C: Confirmation; IP: Individual performance; PU: Perceived Usefulness; CI: Continuance Intention.

reside in the fact that users already assume that m-payment works well, and that it is a mature technology. Another reason may be that our study was conducted in a developing economy context, and that the other studies were conducted in developed economies. A third reason may have to do with the technology studied. The other studies applied different technologies such as web-based learning, social cataloguing sites, online learning, etc. (Cidral et al., 2018; Daｺhan and Akkoyunlu, 2016; Gao et al., 2015). Furthermore, our results indicate that service quality positively influenced use (H3a) and confirmation (H3c), but not satisfaction (H3b). The result of H3a is contradictory with that of Cidral et al. (2018) and Tam and Oliveira (2016), where the relationship was not significant. The result of H3b is consistent with Gao et al. (2015) and Cidral et al. (2018). The result of H3c is consistent with Oghuma et al. (2016), who reports that service quality positively influences confirmation. These findings suggest that m-payment providers should be willing to help the users whenever they need support, should provide personal
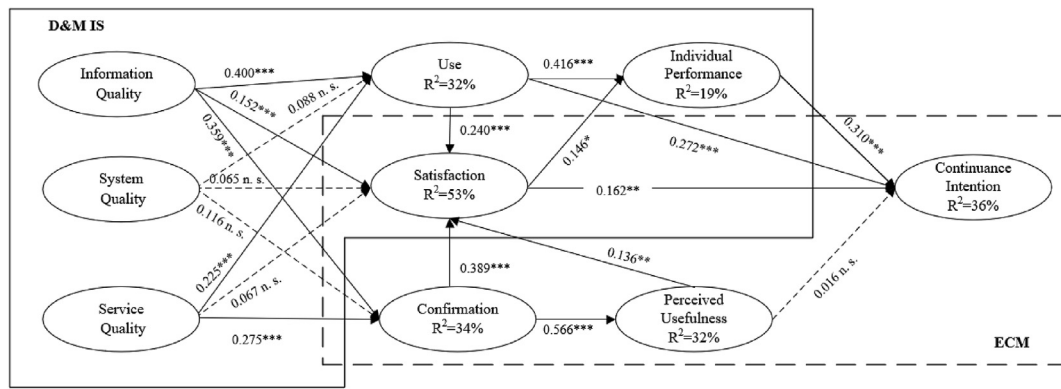
Figure 2. Research model. Notes: Integration of Expectation Confirmation Model (ECM) and DeLone and McLean information system success (D&M IS); (***p < 0.01; **p < 0.05; *p < 0.10).

Table 7. Hypotheses results.

Hypothesis	Independent Construct	→	Dependent construct	Findings (β)	P value	Conclusion
H1a	Information Quality	→	Use	0.400	0.000	Supported
H1b	Information Quality	→	Satisfaction	0.152	0.008	Supported
H1c	Information Quality	→	Confirmation	0.359	0.000	Supported
H2a	System Quality	→	Use	0.088	0.235	Not supported
H2b	System Quality	→	Satisfaction	0.065	0.261	Not supported
H2c	System Quality	→	Confirmation	0.116	0.140	Not supported
H3a	Service Quality	→	Use	0.225	0.001	Supported
H3b	Service Quality	→	Satisfaction	0.067	0.163	Not supported
H3c	Service Quality	→	Confirmation	0.275	0.000	Supported
H4a	Confirmation	→	Satisfaction	0.389	0.000	Supported
H4b	Confirmation	→	Perceived Usefulness	0.566	0.000	Supported
H5a	Use	→	Satisfaction	0.240	0.000	Supported
H5b	Use	→	Individual performance	0.416	0.000	Supported
H5c	Use	→	Continuance Intention	0.272	0.000	Supported
H6a	Satisfaction	→	Individual performance	0.146	0.071	Supported
H6b	Satisfaction	→	Continuance Intention	0.162	0.018	Supported
H7a	Perceived Usefulness	→	Satisfaction	0.136	0.025	Supported
H7b	Perceived Usefulness	→	Continuance Intention	0.016	0.834	Not supported
H8	Individual performance	→	Continuance Intention	0.310	0.000	Supported

help, and should provide services at the time promised, in order to encourage the usage and facilitate the confirmation of expectation of m-payment.

Confirmation positively influences perceived usefulness (H4a) and user satisfaction (H4b) of m-payment (Alraimi et al., 2015; Oghuma et al., 2016; Tam et al., 2020). This means that the experiences using m-payment were positive and user expectations were confirmed (Cheng, 2014; Tam et al., 2020). While for Park et al. (2017) confirmation does not explain user satisfaction. This situation can occur when the initial experience is negative, and the user's expectation is disconfirmed. Additionally, expectation can be different according to the culture of the country. In the current study the participants belong to a developing economy (Mozambique), whereas in the other studies they belong to a developed economy (South Korea). Our results show that the use of m-payment is an important predictor for individual performance (H5a), user satisfaction (H5b), and continuance intention (H5c). This means that the more users use m-payment the more they will perceive the usefulness of m-payment and increase the feeling of satisfaction, consequently motivating users to continue using m-payment. The results indicate that user satisfaction positively influences individual performance (H6a) and continuance intention (H6b) (Chen and Li, 2017; Cidral et al., 2018; Tam et al., 2020; Yu et al., 2018). Park et al. (2017), found a contradictory

result for H6b. The finding indicates that when the user is very happy using m-payment, the satisfaction became an important predictor of continuance intention to use m-payment.

Perceived usefulness positively influences satisfaction (H7a) (Alraimi et al., 2015; Tam et al., 2020) but not continuance intention (H7b) (Hsiao et al., 2016). This means that when users perceive performance, effectiveness, and benefits in using m-payment, satisfaction of the users will be confirmed, and consequently influence their continuance intention to use m-payment. The results also indicate that individual performance positively influences continuance intention (H8). However, individual performance was the strongest construct to predict continuance intention. This finding suggest that when the m-payment allows the users to accomplish their tasks quickly, and when the benefits of the m-payment reflect the daily lives of the users, they begin to feel the intention to continue using m-payment (Morosan and DeFranco, 2016; Zhou, 2014).

Our findings are that the construct system quality is not significant in any of the relationships tested. To avoid confusion in the interpretation of the model we have redrawn the model (Figure 3) and removed system quality. The results show us that there no significant difference between the original model and the recalculated model without system quality, thus supporting our initial model.
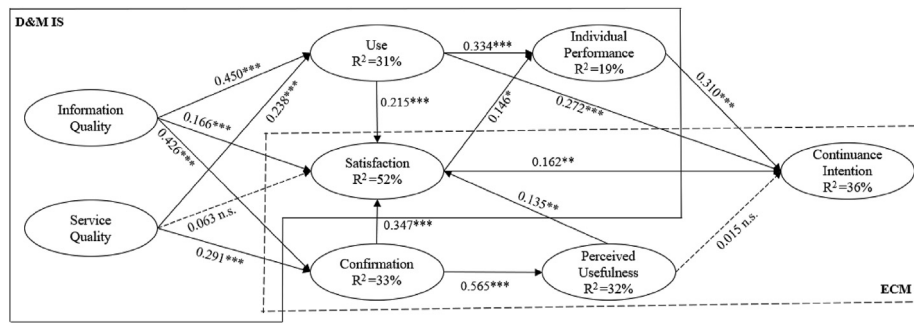
Figure 3. Research model recalculated without system quality. Notes: ECM: Expectation Confirmation Model; D&M IS: DeLone and McLean information system success; (***p < 0.01; **p < 0.05; *p < 0.10).

6.1. Theoretical implications

Based on the D&M IS success and IS continuance models (Bhattacherjee, 2001; DeLone and Mclean, 2003), this study presents a joint model of users' continuance intention to use m-payment. The model here proposed joins the D&M IS success model and the IS continuance model, with the aim of identifying antecedents that focus on satisfaction, individual performance, and continuance intention. The model was proposed and validated empirically in the Mozambican context. The findings provide support for the importance of the added constructs from DeLone and Mclean (2003) in user's continuance intention to use m-payment. Therefore, this foundational contribution opens the door for additional usage of specific models for new research contexts. This study contributes to the long-term usage of information systems and continuance literature. However, if information systems evolve, users will start considering new technology features.

System quality is not supported in any relationship. This result contradicts those of Budiardjo et al. (2017), Cidral et al. (2018), and Gao et al. (2015), suggesting that the construct is not important in that context, meaning that m-payment providers are not concerned with system quality. This calls for future research in the same context with different technologies to confirm the assumptions. This study demonstrates that information quality and service quality are important predictors of use and confirmation, and consequently, use and confirmation are important predictors of satisfaction, individual performance, and perceived usefulness. Satisfaction, use, and individual performance are important predictors of continuance intention to use m-payment. As another theoretical implication, the model validates IS continuance intention theory for the case of m-payment use in Mozambique, unlike previous studies that focused on developed economies (Chen and Li, 2017; Fan et al., 2018; Khalilzadeh et al., 2017; Zhou, 2014).

6.2. Practical implications

The m-payment service designer and providers are informed with our findings to better understand the most important determinants to ensure long-term usage of m-payment and implement new strategies to improve these determinants. For example, information quality and service quality were found to be predictors that influence use and confirmation, thus suggesting that m-payment providers should provide service and information with good quality to make the service easy and intuitive to use and ensure better experiences using it. In other words, m-payment service should not require much effort from the users, and the content should be understandable, interesting, useful, and reliable. The m-payment providers should ensure that the information available is correct, up-to-date, and useful to the user. In addition, m-payment providers should help the users whenever they need help, and thus the quality of the service is very important (Gao et al., 2015). This study also finds that use and confirmation have a significant impact on perceived usefulness, satisfaction, and individual performance. Therefore, when the m-payment service provided is better than expected, users will start to perceive

usefulness and individual performance, and consequently become satisfied with the service. The m-payment providers should ensure that users have a good experience with m-payment, providing good quality services to exceed users' expectations. Service providers should offer suitable solutions, considering the context or environment of the users. The benefits associated with services should be clear in order to positively impact users' sense of satisfaction and their willingness to continue using the service. Satisfaction and individual performance have a significant impact on continuance intention to use m-payment. This suggests that m-payment providers should ensure that users perceive the benefits of using m-payment, to influence users' sense of satisfaction and long-term usage of m-payment, and should seek to create loyalty from their users, to ensure continuance intention to use m-payment.

Satisfaction is important for using m-payment, and thus m-payment providers should ensure that m-payment works well, that the promised services are available, that the users can use m-payment easily, and that it is useful for their daily lives. System quality was not significant for any of the proposed relationships (use, satisfaction, and confirmation), indicating that in the post-adoption phase the quality of the system is not important. This result may be important for the m-payment providers because it may indicate that the users assume that m-payment works well, that it has already reached maturity, and thus the providers may be concerned about improving other factors such as quality of service or information. However, m-payment providers should continue to ensure good system quality in order to sustain users' intentions to continue using m-payment. This suggests that the m-payment providers should constantly improve the system in aspects related to safety, ease of use, and information, to provide a well-structured system that is easy to navigate and has understandable information. Service quality was not relevant for satisfaction to use m-payment. It may be that the user support service is not effective, perhaps hindering access to user support service. Thus, m-payment providers should improve the quality of service, such as user support with different types of support platforms, empowering the staff who will support the users to have the necessary knowledge to help the users with all of their needs, and create support manuals in physical and digital format, guaranteeing support to the users physically and online.

6.3. Limitations and future research

The research has some limitations. The participants of the sample were highly educated and relatively young (adults). Future research could include non-students and broaden the age range of participants. Considering that m-payments process financial transactions, future research can extend the model by combining new factors such as trust and perceived risk in order to add more insights to the research. Our model was proposed for and validated in Mozambique and may not fully represent all potential m-payments users, which might be a threat to our findings. To enhance generalization and external validity, the sample for future research could include other African countries with different cultures and access to resources.

7. Conclusion

The current research approaches the theme of m-payment in an Africa context, testing the empirical case of a modern and important technology in Mozambique. In the IS literature the concept of continuance intention has not been deeply explored regarding this context. To fill this gap, a theoretical innovative framework was proposed by joining the D&M IS success model and the ECM, to understand continuance intention to use m-payment. The empirical results show that continuance intention is positively influenced by individual performance, use, and satisfaction. Information and service quality positively impact the use and confirmation of the expectations. Information quality, use, and confirmation of expectations positively impact user satisfaction. M-payment providers should focus primarily on the quality of information, ensure that information is secure and up to date, and ensure that m-payment services are working properly, to affect m-payment usage and user satisfaction. The use of m-payment, satisfaction, and perceived individual performance are the most important factors to explain the continuance intention to use m-payment.

Declarations

Author contribution statement

Frank Bivar Franque: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Tiago Oliveira, Carlos Tam: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

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Data availability statement

Data included in article.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

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