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Socio-demographic, consumer and product related drivers of mobile payment use and reuse: four theories' explanations

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Abstract: Mobile payment in Ghana increases at a penetration rate of 51.52%, but drivers behind continuous reuse for attainment of critical mass of users are unknown. To holistically examine attitudes, use and continuous reuse drivers, this study integrated four theories to examine how consumer (functional, social, price, hedonic, conditional values, and behavioural beliefs), socio-demographic (peers, family, age, gender, occupation, education) and product-related (relative advantage, complexity, compatibility, cost, communication and trialability) factors impact attitudes, use and continuous reuse intention. A conceptual model was tested with cross-sectional data from 400 Ghanaians (students and lecturers). Structural equation modelling results revealed that price, functional, hedonic values, and behavioural beliefs (consumer factors); complexity, trialability and cost (product-related factors) impacted attitudes. Attitudes, drove adoption, which with peers, family, education, age, occupational experience, influenced the intention to continuously reuse m-payment. Thus, considerations of these factors are advised for attainment of critical mass of re-users. Other implications are provided.

Keywords: consumption values; CV; attitudes; product-related factors; socio-demographics, adoption; continuous reuse intention.

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Biographical notes: Helen Inseng Duh researches on consumer behaviour, brand management, and social marketing. On consumer behaviour, she conducts interdisciplinary research by delving into family, consumer, and social psychology to understand how childhood experiences affect later-life consumer behaviour and well-being. For brand management and social marketing, she conducts research on brand knowledge structure, brand engagement, brand equity, and various aspects of green consumption.

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1 Introduction

It is estimated that globally, there are 866 million mobile phone subscribers with an average of 1.3 billion transactions of mobile payment a day. Sub-Sahara Africa alone has over 50% share of the total global customer base of mobile payment (Coffie et al., 2020). Mobile payment (m-payment) in Sub-Sahara Africa will be further facilitated by a mobile phone penetration rate of 500 million subscribers that was projected by the end of 2020 (Coffie et al., 2020). With these developments, the traditional method of payment for goods and services (cash payment) is progressively giving way to internet and mobile methods of payment and commerce. Statista (2016, p.23) reports that transaction value through m-payment grew from US$450 billion in 2015 to US$780 billion in 2017 and was estimated to reach US$ 1080 billion in 2019. Furthermore, and globally, m-payment subscribers between 2017 and 2020 was estimated to grow from 24.3% to 33.1% and smartphone owners from 50.8 to 76.0 million (Statista, 2016).

According to Kanojia and Lal (2020), transactional value of total amount of m-payment was estimated to be $1,328.244 billion in 2022. Both the number of users and the market size of m-payment are increasing year after year, including developing countries in Africa (Lin et al., 2018; Franque et al., 2023). In Taiwan alone, Lian and Li (2021) report that the regular M-payment users increased from 43.8% in 2018 to 75.4% in 2020, even though the government will want a 90% usage rate by 2025. A global study conducted by Nielsen (2014) found that m-payment users commonly use m-payment service applications for dining (49%), entertainment (43%), shopping (39%), payment (36%), traffic (36%), leasing (19%), etc. The report also revealed that approximately 40% of users globally expressed their intention to re-use mobile payment.

Ghana is regarded as one of the fastest-growing telecommunication nations in Africa (Cudjoe et al., 2015). Consequently, the use of m-payment in the country is increasing. The subscription rate in 2016 stood at 19,7 million, representing a penetration rate of 51.52% (Narteh et al., 2017). Mensah et al. (2020, p.21) report that m-payment services enable Ghanaian consumers 'to transfer money internationally and locally, make deposits and withdrawals, pay utility bills and retail payments, provide payroll services, make loan disbursement and repayments, etc.'. For m-payment service providers to sustainably provide the m-payment services to customers and serve the high number of African customers who lack access to banks and financial services, Jocevski et al. (2020) contend that there must be a critical mass of re-users of the services. After developing a business model with which m-payment service providers can use to increase platform growth for the achievement of critical mass of users, Jocevski et al. (2020) recommended a revisit of theories explaining the adoption of m-payment from a consumer perspective.

Research explaining m-payment adoption in general, and in Ghana specifically, has mostly used one theory, i.e., either the theory of planned behaviour (TPB) or the unified theory of acceptance and use of technology (UTAUT) (see for example Mensah et al., 2020). The use of one theory may limit the explanation of m-payment adoption. After the adoption, are consumers, especially in Africa where the price of data is high and unaffordable to many willing to continuously reuse? More so, the contributions of the m-payment attributes in terms of product-related factors provided by the diffusion of innovation (DOI) theory, consumer factors, such as the consumption values (CV) or m-payment benefits provided by the consumption theory need examination to identify various continuous reuse drivers (Choi et al., 2020). Also of importance, but rarely

studied are the contributions of socio-demographic factors that may influence continuous reuse intention. Examination of these wide range of factors will provide broader insights.

2 Research problem and objective

Studies on m-payment have been conducted in the last couple of years (Dahlberg et al., 2015; Mensah et al., 2020) with main focus on explaining adoption intentions, limited examination of actual adoption and reuse, and mostly using one theory or model (Franque et al., 2023). Swiecka et al. (2021) and Franque et al. (2023) highlight that consumers' financial decisions are complex and influenced by diversity of factors, which can not be explained by one theory or model. Thus, there was a need for a more holistic understanding of m-payment determinants, including reuse determinants using a multi-theoretical/models approach that captures varied drivers, produces a stronger predictive model and variance explained (Slade et al., 2015a; Mensah et al., 2020; Swiecka et al., 2021; Franque et al., 2023).

Prominent among the theories and models applied to understand m-payment adoption are the technology acceptance model (TAM) proposed by Davis (1989), the TPB proposed by Ajzen (1991), UTAUT proposed by Venkatesh et al. (2003), an extended UTAUT named UTAUT2 and proposed by Venkatesh et al. (2012). These models and theories generally overemphasise the role of psychological determinants, such behavioural beliefs, attitudes, perceptions, and intentions. The models and theories also omit the contributions of product-related attributes provided by the DOI theory and the values/benefits that consumers enjoy from the use of m-payment provided by the consumption value theory (CVT). Also often omitted and provided by the UTAUT2, are the socio-demographic variables, such as education, age, gender, peers, occupation, and family impacting decisions to adopt or not to adopt a technology (Dahlberg et al., 2015). Even when consumers have adopted an innovation, Bartels and Reinders (2011) and Franque et al. (2023) assert that continuous reuse may fail when firms do not understand consumer needs and provide the benefits they seek and enjoy from the innovation. In Africa for example, where the cost of data and multi-functional smartphones are high, amidst fewer cash alternatives like credit cards, bank accounts and many excluded persons from financial systems, Franque et al. (2023) question levels of m-payment reuse intentions and its varied drivers.

To identify the varied drivers of reuse intentions, the isolated use of mainly the TPB, UTUAT, DOI and CV theories provides limited explanation. For more holistic understanding and following the recommendations to use a multi-theoretical model for the examination of varied personal/consumer, technological/product-related and external social factors impacting the adoption and reuse of technological innovations, the objective of this study was to integrate study-relevant aspects of the TPB, UTAUT2, DOI and CV theories. This was to holistically examine the extent to which consumer factors (functional, social, price, hedonic, conditional values, and behavioural beliefs), socio-demographic factors (peers, family, age, gender, occupation, education) and product-related factors (relative advantage, complexity, compatibility, cost, communication and trialability) influence attitudes, actual use and intention to continuously reuse m-payment in Ghana.

3 Theoretical background, integrated conceptual model and hypotheses development

Before discussing the theoretical background of this study, it is important to first describe m-payment.

3.1 Descriptions of mobile payment

Dahlberg et al. (2015) describe mobile payment (m-payment) as payments made through any mobile device for bills, services, goods, by taking advantage of wireless and other communication technologies. They assert that m-payments are carried out with a mobile credit card or a mobile wallet. Phonthanukitithaworn et al. (2016) further explain m-payment as utilisation of a mobile device such as a smartphone, a personal digital assistant, to electronically send money from one person (payer) to another (receiver) directly or through an intermediary). de Luna et al. (2019, p.932) describe m-payment as 'business activity involving an electronic device connected to a mobile network enabling the successful completion of an economic transaction'.

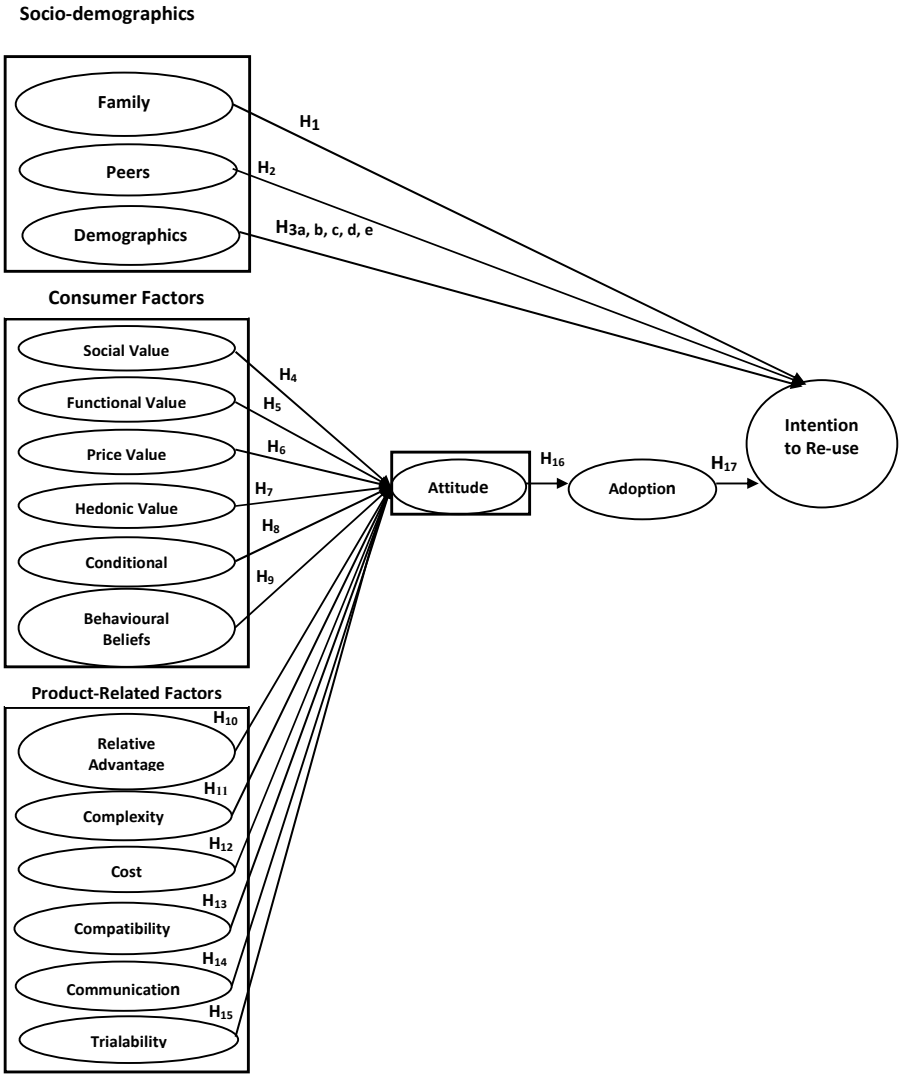
M-payment has been classified by de Luna et al. (2019) in terms of proximity (i.e., close proximity at the store counter or remote online payments done using mobile phones) and in terms of types of relationships with the customer (i.e., peer-to-peer, customer-to-customer and business-to-customer (B2C)) Regarding the B2C relationship, de Luna et al. (2019) suggest that there are three main technological systems developed to implement m-payments. The three systems are short message service (SMS), which is a remote payment system, the quick response (QR), and near field communication (NFC) systems, which are close proximity systems. Notwithstanding these descriptions from various authors, there are distinctive underlying characteristics that cut across the descriptions. This involves payments made through a mobile device by the help of wireless and communication technology. This study recognises this common view of m-payment.

3.2 The use of the TPB, UTAUT2, DOI and CVT to develop an integrated model for this study

As aforementioned, aspects of TPB, UTAUT2, DOI and CV theories relevant for this study were integrated to develop an integrated conceptual model that delineates how consumer-related, product-related and socio-demographic factors impact m-payment attitude, adoption and continuous reuse intention. The TPB posits that technology adoption is indirectly influenced by attitudes, social norms and perceived behavioural control or beliefs through behavioural intention (Ajzen, 1991). Since attitude projects a strong mental inclination to act from an overall evaluation of a particular product or engaging in a behaviour with some degree of approval or disapproval and knowledge of its predictors are limited (Huang et al., 2015), this study suggest that CV and product-related factors will predict attitudes towards m-payment. Sheth et al. (1991) CV theory proposes functional, epistemic, conditional, social and emotional values as the CV influencing consumers' buying choices. In addition to these sought-after values or benefits by consumers, Venkatesh et al.'s (2012) UTAUT2 model suggest that price value and hedonic value, which embodies the Sheth et al.'s (1991) epistemic and emotional values are other benefits consumers consider before their predisposition to buy

or use a product or an innovation. Thus, to predict attitudes, which is proposed in this study as a direct driver of behaviour/adoption following Dai et al. (2018), the current study assessed the impact of functional, conditional, social, price and hedonic values.

Figure 1 The conceptual model



To further enrich the explanation of attitudes toward m-payment adoption, this study also examined the influence of technology/product-related factors (relative advantage, complexity, compatibility, trialability, cost and observability or communication) suggested by Roger's (2003) DOI theory. Venkatesh et al.'s (2012) UTAUT2 suggests that socio-demographic factors also play a role in the adoption of technology. While they view social influence unidimensionally, this study examines social influence in terms of

peers and family to be more specific. The resultant integrated concept model for this study is presented in Figure 1.

3.3 Hypothesis development

3.3.1 Socio-demographic factors and M-payment continuous reuse intention

Some literature on technology adoption behaviour uncovers certain socio-demographic characteristics as drivers. They include gender, age, income, occupation, family, peers and social class. For example, Venkatesh et al.'s (2012) UTAUT2 model suggests that age, gender, occupation experience and social influence impact how much adoption intention and actual adoption are attained. Venkatesh et al. (2012, p.159) define social influence as 'the extent to which consumers perceive that important others (e.g., family and friends) believe they should use a particular technology'. While Venkatesh et al. (2012) suggest that socio-demographic factors impact technology adoption, Murendo et al. (2018) did not find age and gender as significantly impacting m-payment adoption in Uganda.

According to the social resources theory (SRT), education is one of the strongest predictors of information search and products adoption. Specifically, and amongst income, occupation, and other socio-economic factors that SRT suggests as drivers of information access, education was found to predict the frequency more strongly at which health information is sought in the USA (Song and Chang, 2012). Education also increases the propensity to seek and accept information products in China (Zhang et al., 2012). Agag et al. (2020) contend that demographic variables (age, gender, occupation, education, etc.) contribute to closing the intention-actual behaviour gap. According to the Nielsen (2014) report, socio-demographic factors in addition to pricing (e.g., discounts) policies should be other factors to consider in attempts to get more re-users of m-payment.

In terms of social factors, Murendo et al. (2018) found that the number of a social network (made up of peers and family members) and not education impacted the adoption of m-payment in Uanda. In Ghana as well, Narteh et al. (2017) found that social influence in terms of peers and family significantly impacted m-payment. Narteh et al. (2017, p.428) explain that social influence predicts m-payment because 'a user may be reluctant to participate in a certain behaviour at first, but when taking into consideration the importance of what the referents (i.e., friends/peers, family, etc.) think,' they can change their attitudes and adopt an innovation. Narteh et al. (2017, p.429) provide three reasons why peers and family exert influence on consumers. They are:

1 the aspiration to embrace correct opinions

2 the ability to agree with others in quest to seek social rewards

3 the capacity to uphold and express an important identity.

The interdependent between customer groups, are some of the factors that Jocevski et al. (2020) propose will increase the critical mass of m-payment users and re-users. In line with the foregoing arguments, the following hypotheses are proposed:

H1 There is a positive relationship between peer influence and m-payment continuous reuse intention.

H2 There is a positive relationship between family influence and m-payment continuous reuse intention.

H3 a, b, c, d, e: While age

- a will negative impact intention to continuously reuse m-payment, gender
- b education
- c occupation type
- d and occupation experience
- e will positively influence the intention to continuously reuse m-payment.

The H3 a, b, c, d and e hypotheses were tested as control variables.

3.3.2 Consumer factors (consumption values and behavioural beliefs) and attitudes toward adoption of M-payment

Sheth et al. (1991) CV theory assert functional, epistemic, conditional, social and emotional values as the CV or benefits that consumers seek in making buying choices. Following Dilotsotlhe and Duh's (2021) and Venkatesh et al.'s (2012) studies related to innovation adoption, the values found useful and examined in the current study are functional, social, conditional, hedonic (embodying emotional and epistemic value) and price values. Also included in this study and derived from the TPB is the perceived behavioural beliefs. Functional value concerns the utilitarian functions and services that a product can offer (Wang et al., 2013). The value is mostly showed through combined attributes of products such as qualities and features that can deliver impressive functional performance (Dilotsotlhe and Duh, 2021; Tzeng, 2011). Therefore, the functional value of m-payment denotes the information provision and its physical attribute to perform the utilitarian function (e.g., speed of payment, network connectivity) for the consumer. Previous studies discuss functionality in the context of website, internet and mobile attributes enabling m-payment. These functional attributes, friendly usability according to Sun et al. (2020) impact customer satisfaction. Before satisfaction is gained, Bailey et al. (2020) indicate that functionality like perceived ease of use and perceived usefulness first influence attitude toward m-payment among millennial consumers in US.

Social value is defined as the perceived utility acquired from one's association with one or more specific social groups [Wang et al., (2013), p.14]. Social value relates to social approval and the enhancement of self-image among other individuals, which impact the use of m-payment (Slade et al., 2015b). People commonly turn to certain groups for their standards or judgements towards a particular behaviour (Sun et al., 2020). According to Wang et al. (2016) when consumers intend to search for product information, they first run to social networking platforms to communicate with their friends and families using their smartphones. Zhang and Mao (2020) assert that with limited or no experience with m-payments, consumers more likely look for advice from their social networks of friends and family. This impacts their attitudes towards the product or innovations and ultimate use.

Venkatesh et al. (2012, p.161) define hedonic value as "the fun or pleasure or perceived enjoyment derived from using a technology", and price value as 'consumers' cognitive trade-off between the perceived benefits of technological applications and the cost of using them'. As aforementioned, hedonic value also encompasses the aroused feelings, curiosity and excitement embodied in Sheth et al.'s (1991) epistemic and

emotional values. While hedonic value positively impacts attitudes and technology acceptance and use (Brown and Venkatesh 2005), the direction of impact (negative or positive) of price value depends on whether the benefits of technology use outweigh the cost. For example, the price value will positively impact attitudes, intention, and technology use, when the benefits of using the technology are perceived to be greater than the monetary cost (Venkatesh et al., 2012).

Sheth et al. (1991) describe conditional value as the perceived utility acquired as the result of a specific situation or set of circumstances facing a choice maker. Wang et al. (2013) postulate that conditional value rest on the context in which the value judgment occurs and exits only within a specific context. For m-payment, conditional value stems from the fact that the customers can access the services to pay for products/goods promptly even if they do not carry cash/card, without having to go to another location to withdraw money and the payment can be made anywhere and anytime. Wang et al. (2013) and Agag et al. (2020) found that conditional value impacted consumers' attitudes towards use of mobile Apps and consumption of green products respectively.

Guinea et al. (2014, p.180) describe perceived behavioural beliefs as the "perceived usefulness and perceived ease of use of a technology which have been identified as the most influential antecedents of individuals' information systems use intentions and behaviours within the TAM". The perceived usefulness and perceived ease of use that make up behavioural beliefs are another consumer factors that Wiese and Humbani (2020, p.128) report, 'may serve as cognitive antecedents of attitudes toward m-payment apps'. Based on these suggestions, the following hypotheses are developed:

H4 A positive relationship exists between social value and m-payment attitude.

H5 There is a positive relationship between functional value and m-payment attitude.

H6 There is a positive relationship between price value and m-payment attitude.

H7 Hedonic value will positively impact m-payment attitude.

H8 The impact of conditional value on m-payment attitude will be positive.

H9 Behavioural beliefs have positive impact on m-payment attitude.

3.3.3 Product-related factors, attitudes, adoption and intention to continuously reuse M-payment

Considering that an innovation is disruptive and first limitedly used before it diffuses or is being re-used (Rogers, 2003), we had to examine how the factors related to the innovation/product (relative advantage, compatibility, complexity, cost, trialability and communication/observability) provided by the DOI theory impact both attitude before adoption. More so, an adoption of an innovation does not necessarily mean that there will be a continuous reuse. Therefore, there was a need to examine whether consumers have intentions to continuously reuse m-payment and how much socio-demographic factors impact the intentions. Al-Jabri and Sohail (2012, p.381) define relative advantage as the degree to which an innovation is perceived as providing more benefits than its predecessor and results in 'increased efficiency, economic benefits and enhanced status'. Rogers (2010, p.15) defines compatibility as "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters", and complexity as "the degree to which an innovation is perceived as

relatively difficult to understand and use" (p.16). Observability/communication is the degree to which the effects of adoption are visible or communicated to others", and trialability is "the degree to which an innovation may be experimented on a limited basis" [Rogers, (2010), p.16].

Even though the DOI theory has been applied in e-commerce studies, there are limited studies that apply the theory to understand m-payment adoption. The few studies show that behavioural intention to use m-payment is positively influenced by relative advantage (Osei-Assibey, 2015) and negatively by complexity (Narteh et al., 2017; Cham et al., 2022). Relative advantage does not only positively influence behavioural intention, but it does also impact m-payment reuse intention indirectly through trust (Shao et al., 2019). According to Dilotsotlhe and Duh (2021), relative advantage will first influence attitudes before impacting adoption in the case of green appliances. Dilotsotlhe and Duh (2021) found a negative relationship between complexity and attitudes towards green appliances purchases. They also found that compatibility and observability/communication are positive drivers of the attitudes, which they found to be a strong predictor behavioural intentions. Trailability does not seem to influence attitudes and intention in Shankar and Datta's (2018) studies. While Upadhyay and Jahanyan (2016) did not find cost in perceived monetary value to influence m-payment usage intention, Lin et al. (2020) found that relative advantage, service compatibility and costs as significant determinants. For mobile marketing, Maduku et al. (2016) found cost to be a negative driver of the intention to use mobile marketing by small and medium size businesses.

Some researchers have found that the innovation/product-related factors may first impact attitudes before they drive adoption and then continuous reuse intention. For example, while Cudjoe et al. (2015) found that perceived cost and compatibility directly impacts adoption of mobile banking in Ghana, Chawla and Joshi's (2019) study in India showed that it first impacted consumer attitude to use mobile wallets before impacting intention. This is in line with the TPB that posits that attitude towards a certain behaviour shapes an individual's behavioural intentions, which is a driver of actual adoption (Ajzen, 1991). However, attitudes can also directly impact adoption, which in turn is a driver of the frequency of use (reuse) as was found in the context of retailers' mobile commerce apps (McLean et al., 2020). The attitude, as Min et al. (2020) found, is influenced by innovation attributes, such as compatibility, complexity, relative advantage and observability through perceived usefulness and perceived ease of use in the case of Uber mobile app adoption. For the adoption of online fashion clothing renting, Lee and Chow (2020) found that relative advantage and compatibility impacted attitudes directly. While Chalomba et al. (2019) suggest that the attitude directly impacts intention to reuse branded mobile app, we propose that it will first impact adoption before the continuous reuse intentions. Thus, the following hypotheses are formulated:

H10 Relative advantage will positively impact attitudes to adopt m-payment.

H11 There is a negative relationship between complexity and attitudes to adopt m-payment.

H12 Cost will negatively influence attitudes to adopt m-payment.

H13 There is a positive relationship between compatibility and m-payment attitudes.

H14 Communication will relate positively with m-payment attitudes.

H15 Trialability will have a positive impact on m-payment attitudes.

H16 M-payment attitude will positively impact its adoption.

H17 M-payment adoption will positively impact the intention to continuously reuse it.

The hypotheses are presented in Figure 1.

Table 1 Demographic profile of respondents

Demographics features		*Frequency*	*Percent*
Gender	Male	227	56.8
	Female	173	43.2
Total		400	100
Age (in complete years)	20–29	191	47.8%
	30–39	133	33.2%
	40–49	57	14.3%
	50–59	14	3.4%
	60+	5	1.3%
Total		400	100
Occupation type	Formal sector	293	73.2%
	Informal sector	107	26.8%
Total		400	100
Occupation experience	Not working	52	13%
	1–5	150	37.5%
	6–10	95	23.8%
	11–15	47	11.7%
	16–20	56	14.0%
Total		400	100
Level of education	Undergraduate	254	36.4%
	Postgraduate (with 30 lecturers)	146	63.6%
	Total	400	100

4 Methodology

4.1 Research design and sample

Since a model with hypotheses had to be tested, quantitative methods were used to collect and analyse data. The data was collected with a cross-sectional survey from m-payment users in Ghana. Thus, a purposive (only m-payment users) and convenience non-probability sampling methods were used. A convenience sampling was an option because it was not possible to get a list of all the students and staff for random selection in a probability sampling method. Self-administered questionnaires were distributed to lecturers and students (undergraduates and postgraduates) at the university of Ghana, because it is the largest public university amongst the thirteen public universities in Ghana. It enrols students of various cultural and socio-economic backgrounds at various

study levels and programmes. Out of the 510 questionnaires distributed to the respondents in classes and offices after obtaining ethical clearance and permission from the university, 400 fully completed responses were retained for analyses. The 110 incomplete responses with missing data were discarded from further analyses. This sample size comprising 30 lecturers and 330 students was sufficient to conduct structural equation modelling (SEM) used for this study and following Siddiqui's (2013) suggestion that a sample size of between 200 and 400 suffices to conduct SEM with 10 and above number of constructs. The ages of the respondents ranged from 20 years to above 60 years. The respondents qualified to participate in the study after a screening question that ensured that they have used m-payment before. The characteristics of the sample is in Table 1.

4.2 Measures

The measurement instruments were adapted from Dilotsotlhe and Duh (2021), Moore and Benbasat (1991), Maduku et al. (2016), Chalomba et al. (2019), Oliveira et al. (2015), and Zhang et al. (2017) (See Appendix A for respective constructs' instruments sources from these authors). The scales used were 5-point Likert scale which was anchored by 1 = strongly disagree to 5= strongly agree. Age, gender, education, work experience and work type were the demographic variables measured and guided by Hsbollah and Idris' (2009) and Venkatesh et al.'s (2012) studies. A pre-test involving 20 respondents was conducted to ensure that the questions were clear, and the scales were reliable and valid. After analysing data from the pre-test, few adjustments in sentence wordings were made. Some items that had low reliability scores (below 0.4) and cross-loaded unto other constructs from a test of common-method variance (Malhotra et al., 2006) were deleted.

5 Analyses and results

Considering that SEM is flexible, measures confirmatory factor analyses, multiple relationships, and does model validation simultaneously (Dash and Paul, 2021), it was used in this study to test the hypotheses. Amongst the two types of SEM: covariance-based (CB-SEM) and partial least square based (PLS-SEM), Dash and Paul (2021) found that 'CB-SEM is better in providing model fit indices', which is required to assess the fit between the data and the model. Thus, CB-SEM was used to test the conceptual model. Since SEM evaluates two models: measurement model and path analysis (Dash and Paul, 2021), a measurement model (to test reliability, validity and model fits using confirmatory factor analyses) and a path analysis (measuring the relationships between the constructs) were conducted. The analyses started with descriptive statistics.

5.1 Descriptive statistics

The statistics are in Table 1. The table shows that 81 % of the respondents were Millennials (20–39 years old in 2020), while 19% were adults, probably because most of the respondents were students. Millennials according to Parment (2013) are those born

between 1980 to 2000, have been exposed to the internet, digital devices, and mobile phones from birth. Thus, adopting m-payment to this consumer cohort is easy. Although more students than lecturers participated in the study, most of them are working, with 37.5% having 1–5 years' work experience and up to 73.2% working in a formal sector. More postgraduate (63.6%) than undergraduate (36.4%) participated in the study.

Table 2 Reliability and convergent validity test results

Construct	*Item code*	*Average variance extracted (AVE)*	*Composite reliability (CR)*	*Cronbach's alpha (CA)*	*Variance inflation factor (VIF)*
Peers	PS	0.697	0.821	0.738	1.471
Family	FM	0.734	0.846	0.828	1.463
Education	ED	0.602	0.725	0.700	1.222
Social value	SV	0.551	0.772	0.771	1.652
Functional value	FV	0.692	0.818	0.814	2.025
Price value	PV	0.693	0.818	0.835	1.000
Hedonic value	HV	0.634	0.842	0.816	1.803
Conditional value	CV	0.515	0.759	0.760	1.406
Behavioural beliefs	BB	0.673	0.804	0.800	1.265
Relative advantage	RA	0.758	0.751	0.749	2.283
Complexity	CX	0.671	0.854	0.859	1.173
Compatibility	CO	0.710	0.838	0.830	1.696
Cost	CT	0.621	0.795	0.867	1.148
Communication	CN	0.534	0.742	0.702	1.545
Trialability	TB	0.641	0.775	0.767	1.509
Attitude	AT	0.714	0.890	0.833	1.000
Adoption	AD	0.827	0.886	0.905	1.000
Reuse intention	RU	0.723	0.876	0.886	1.704

5.2 Assessing common method bias

Although Bozionelos and Simmering (2022, p.194) found that 'that the probability of significant distortion of estimates because of common method variance (CMV) is very limited, this study assessed the presence of the bias following the use of a cross-sectional data. This was done with Harman's one/single-factor test whereby all the items were subjected to an exploratory factor analyses. The unrotated model did not produce a one factor model. The first factor in our resultant 14-factor model had a variance extracted of 18.8% which was far lower than the recommended <50% [Bozionelos and Simmering, (2022), p.194]. Thus, there was no CMV problem.

Table 3 Discriminant validity after deletions of invalid constructs

	Mean	*PS*	*CO*	*ED*	*PV*	*HV*	*CT*	*FM*	*AD*	*AT*	*CX*	*TB*	*FV*	*BB*	*RU*
PS	3.43	0.835													
CO	3.84	0.242	0.843												
ED	3.12	0.387	0.376	0.820											
PV	4.16	0.131	0.546	0.258	0.832										
HV	3.99	0.229	0.683	0.308	0.695	0.830									
CT	2.46	0.011	–0.075	0.265	–0.233	–0.105	0.813								
FM	3.83	0.337	0.429	0.253	0.423	0.457	–0.090	0.857							
AD	4.17	0.193	0.623	0.296	0.601	0.597	–0.247	0.335	0.909						
AT	4.22	0.159	0.645	0.234	0.752	0.669	–0.307	0.389	0.838	0.845					
CX	2.36	0.101	–0.080	0.329	–0.203	–0.117	0.785	–0.045	–0.125	–0.153	0.819				
TB	4.16	0.196	0.659	0.254	0.621	0.568	–0.079	0.306	0.665	0.734	–0.044	0.789			
FV	4.20	0.089	0.600	0.201	0.795	0.827	–0.087	0.462	0.503	0.564	–0.135	0.565	0.832		
BB	3.88	0.132	0.468	0.203	0.433	0.440	0.042	0.245	0.470	0.462	0.070	0.452	0.535	0.818	
RU	3.99	0.177	0.654	0.345	0.485	0.651	–0.050	0.302	0.698	0.702	0.027	0.548	0.505	0.425	0.850

Notes: NB: PS = peer, CO = compatibility, ED = Education, PV = price value, HV = hedonic value, CT = cost, FM = family, AD = adoption, AT = attitude, CX = complexity, TB = trialability, FV = functional value, BB = behavioural beliefs, RU=reuse.

5.3 Measurement model

The measurement model was subjected to convergent validity and discriminant validity. Additionally, the reliability of the scales or instruments was tested using composite reliability (CR) and Cronbach's alpha (CA).

5.3.1 Reliability and validity

The results are Table 2 and Table 3.

Table 2 shows that the CR and CA figures range from 0.7 to 0.905. These figures all meet the recommended threshold of 0.7. The AVE which measures the convergent validity also met the recommended 0.4 threshold (Hair et al., 2010). The discriminant validity was examined by comparing the square root of the AVE values and the inter-construct correlation coefficients. Fornell and Larcker (1981) posit that for discriminant validity to be attained, the square root of an AVE for a construct should be greater than its correlation with other constructs. With this criterion some constructs (social and conditional, relative advantage and communication were dropped from further analyses because the square root of their AVE values were less than the correlation coefficients with other constructs. After all these deletions, the data was re-run and the resultant correlation matrix is in Table 3. To test for multicollinearity, Kwok et al. (2021) recommend that the variance inflation factor (VIF) be tested. VIF is assessed from the table that has the coefficients of how much the predictors impact the dependent variables. When the value of VIF < 5, there is absence of multicollinearity issues (Kwok et al., 2021). Table 2 shows that all the VIF values were < 5, thus there was no multicollinearity problem.

5.3.2 Model fit

From the measurement model, the goodness of fit indices obtained were: chi-square ($\chi 2$/df) of 1.971, CFI of 0.957, TLI of 0.941, IFI of 0.958, NFI of 0.919, RMSEA of 0.049. The results of these fit indices are well within the acceptable thresholds of the goodness of fit (Hair et al., 2010). Thus, the measurement model had a good fit with the observed data.

5.4 Structural model results

The results of the structural model are in Table 4. Table 4 shows that Ghanaian consumers' attitudes towards the use of m-payment are significantly influenced by functional ($\beta = 0.52$; $\rho < 0.01$), price ($\beta = 0.51$; $\rho < 0.01$), hedonic ($\beta = 0.42$; $\rho < 0.01$), behavioural beliefs ($\beta = 0.14$; $\rho < 0.05$) consumer factors; complexity ($\beta = –0.21$; $\rho < 0.05$), cost ($\beta = –0.32$; $\rho < 0.01$), and trialability ($\beta = 0.32$; $\rho < 0.01$) product-related factors and not compatibility ($\beta = 0.012$; ns). The attitude in turn significantly impacted m-payment adoption ($\beta = 0.83$; $\rho < 0.01$), which is in turn was a positive driver of continuous reuse intention ($\beta = 0.78$; $\rho < 0.01$). The continuous reuse intention was also significantly influenced by peers ($\beta = 0.138$; $\rho < 0.01$), family ($\beta = 0.268$; $\rho < 0.01$), age ($\beta = –0.129$ $\rho < 0.01$), education level ($\beta = 0.076$; $\rho < 0.09$), occupation experience ($\beta = 0.81$; $\rho < 0.09$) and not gender ($\beta = 0.33$; ns) and occupation type ($\beta = 0.13$; ns).

Table 4 Structural model results

Hypotheses	*Standardised regression paths*	*β–estimates*	*T-value*	*P-value*	*Result*
H1	Reuse <--- peers	0.138	2.771	0.006***	Supported
H2	Reuse <--- family	0.268	5.360	0.000***	Supported
H5	Attitude <--- functional value	0.52	2.974	0.003***	Supported
H6	Attitude <--- price value	0.51	4.305	0.000***	Supported
H7	Attitude <--- hedonic value	0.42	3.097	0.002***	Supported
H9	Attitude <--- behavioural beliefs	0.14	2.289	0.022**	Supported
H11	Attitude <--- complexity	–0.21	2.275	0.023**	Supported
H12	Attitude <--- cost	–0.32	–3.288	0.001***	Supported
H13	Attitude <--- compatibility	0.12	1.381	0.167	Not supported
H15	Attitude <--- trialability	0.32	3.908	0.000***	Supported
H16	Adoption <--- ATT	0.83	16.189	0.000***	Supported
H17	Reuse intention <--- adoption	0.78	16.671	0.000**	Supported
	Control: gender (H3a)	0.033	1.006	0.314	
	Age (H3b)	–0.129	–2.456	0.014***	
	Educational level (H3c)	0.076	1.820	0.069*	
	Occupation – type (H3d)	0.013	0.350	0.727	
	Occupation – experience (H3e)	0.081	1.659	0.092*	

Notes: *** = $p < 0.01$; ** = $p < 0.05$; * = $p < 0.09$, RMSEA = 0.045, GFI= 0.933, NFI = 0.932, TLI = 0.954, IFI = 0.968, RFI = 0.902 CFI = 0.968, PClose = 0.866, CMIN/DF=1.811. R^2 (attitude) = 81.2%; R^2 (adoption) = 69.9%; R^2 (reuse intention) = 67.8%.

6 Discussion, theoretical and practical implications

6.1 Discussion

Considering the benefits of m-payment and the fact that its adoption does not guarantee that consumers will continuously reuse it, this study examined the socio-demographic, consumer-related and product-related factors impacting Ghanaian consumers' attitudes, adoption, and continuous reuse intention of m-payment. Of the consumer-related factors studied and according to the CVT, it was found that the Ghanaian consumers' attitudes were built from both utilitarian (functional and value-for-money) and hedonic (pleasure and excitement) benefits they get from the innovation. This supports a study in France by de Kerviler Demoulin and Zidda (2016) who also found that hedonic value impacted attitudes towards proximity m-payment. The price and hedonic values driving attitudes in the current study also support Venkatesh et al.'s (2012) UTAUT2 propositions. The

positive relationship between price value and attitude is an indication that the benefits are perceived to be greater than the cost as Venkatesh et al. (2012) proposed. Price value is a subjective measure of what is paid for, compared to the benefits received (Chuah et al., 2014). So, while the attitudes of potential m-payment users are negatively influenced by price value as Yang et al. (2012) found in China, this study found that for actual users, price value produces a positive attitude because of the realisation of the relative benefits over price paid. We also found that perceived behavioural beliefs or control significantly impacted attitudes, which is found as a strong and direct driver of m-payment adoption in our study. While Verma et al. (2019) in an Indian study found that perceived behavioural control and attitudes directly impact continuance reuse intentions of m-payment, this study shows that these constructs first influence actual use before the reuse intentions.

Regarding the explanation by the DOI theory, it was found that complexity and cost negatively and significantly impacted attitudes as hypothesised These findings are in line with what the DOI proposes and what Cham et al. (2022) in Malaysia show to be barriers to m-payment attitude formation especially for older consumers. Another DOI construct that impacted attitudes is trialability. This supports Ho et al.'s (2020) study in Vietnam but refutes that in Taiwan. This means that although perception of complexity negatively influenced Ghanian consumers' m-payment attitudes, a trial of it gained positive attitudes. However, and unlike Ho et al.'s study in Taiwan and Vietnam, compatibility in the current study did not make a significant impact on attitudes. This could be explained from Shaw et al. (2022) study that found that it is compatibility towards relative advantage and not towards previous payment mode that impacts attitudes towards m-payment. As was the case in Shaw et al.'s (2022) study in three developed countries, only three out of DOI's six factors drove m-payment adoption behaviours.

Except for gender, this study shows that most of UTAUT2 proposed socio-demographic factors (i.e., peers, family, age, work experience) did impact continuance use intentions in this study. Our findings on the impact of socio-demographic factors are in line with prior research that identified peers, family, and social class as determinants of attitudes towards innovations (Phonthanukitithaworn et al., 2016; Song and Chang, 2012; Narteh et al., 2017). The prior researchers found in their studies that the influence of friends, parents, and colleagues can become important determinants in the formation of attitudes and decision-making process of potential users in adopting m-payment services. In the early stages of m-payment adoption, there will be limited information about the services amongst potential adopters. Arguably, people with no previous experience in using this type of service may rely on other people's opinions to help them make their decision. Thus, a study conducted by Narteh et al. (2017) found that the opinions of peers and family were important in the formation of attitudes. Our study goes further to show that peers and family are continually needed even during the reuse process. The younger, educated people and those experienced in their jobs as found in this study to be more apt to continuously reuse m-payment may not need peers and family to persuade or assist them in the use of m-payment. These are in support of Agag et al. (2020), who contend that demographic variables (age, gender, occupation, education, etc.) contribute to the adoption and continuous reuse of innovations.

In line with the TPB, attitude was found to have a strong and significant positive impact on adoption of m-payment in this study. While the TPB and prior literature (e.g., Chawla and Joshi, 2019) show a positive relationship between the attitudes and the intention to use m-payment services, the current study extends these studies by showing that the attitudes can also impact actual adoption and not only intention to adopt. Thus,

our finding enriches the TPB and shows that after adopting m-payment, Ghanaian consumers have the intention to continuously reuse the service. Consequently, Ghanaian consumers' intentions to continuously reuse m-payment exhibit sustainability for the service providers, especially as they also agreed to the continuous reuse intention with (mean = 3.99). This finding supports a study in a hotel context by Sun et al. (2020) who found that when Chinese consumers have adopted m-payment-based hotel reservation and are satisfied with the service, they would develop the intention to continuously use the service.

6.2 Theoretical implications

There has been an extensive use of CV theory to explain behavioural choices from many disciplines, such as economics, sociology, psychology, and marketing. However, it has been overlooked in the m-payment study despite m-payment being an alternative payment option that would have to provide some benefits to motivate its adoption and sustained use. To fill this gap, this study theoretically contributes by not only using the CV theory to explain m-payment attitudes, but by also adding the DOI theory. The integration of the CV and DOI theories in this study provided a high explanatory power (81.25%) of attitudes. This enriches the explanation of attitudes found in the TPB, while also uncovering many drivers of attitudes, which the TPB lacks. Assessing consumers' attitude and its drivers are important because attitude helps in the understanding of the reasons consumers buy or do not buy products and services. Attitudes are also used to judge the effectiveness of marketing activities and actions before they are implemented (Sun et al., 2020).

Using the value-attitude-behaviour theory, there is the concern that positive attitudes is no guarantee that action or behaviour will be taken and Sadiq et al. (2022) question which values can enhance attitudes to the point of generating action. In the context of m-payment and especially in Africa where infrastructure and socio-economic constraints can prevent the translation of attitudes into action, this study contributes by showing that when functional and hedonic values, and less complexity and cost are behind positive attitudes formation, actual m-payment adoption to the point of reuse intentions is possible. To enrich the explanations, the study integrated the DOI, TPB, UTUAT2 and CV theories to develop a conceptual model. The integrated model produced very high explanatory powers of attitude (81.2%) actual adoption (69.9%) and reuse intention (67.8%). With these high explanatory powers, the conceptual model can be used not only for explaining m-payment in other countries, but also in studies of other types of consumer behaviour, such as green and pro-environmental behaviours. Most previous studies have focused on explaining adoption intension. This study contributes by providing a model that can be used to study actual adoption among users and not the usual non-users surveyed in previous studies. By examining consumer and product/innovation factors, this study will be useful for both consumer and information technology researchers and practitioners.

6.3 Practical implications

With the finding that both functional and hedonic values impacted attitudes, is a signal to Ghanian marketers that while they provide and promote m-payment functional attributes, like convenience, quality, speed of transaction at value-for-money prices, they should

remember to highlight the hedonic benefits. Marketers, retailers, and bankers in Ghana should also educate consumers on how to make all types of m-payments, especially as the current study found that complexity and behavioural beliefs impact attitudes negatively and positively respectively.

While Chen (2008) in the USA and Schierz et al. (2010) in Germany and Yang et al. (2012) reveal that compatibility tends to produce a strong impact on individuals' behavioural intentions among non-users or potential users, our study reveals that even users still appreciate that innovations made in the m-payment systems should not be complex, can be easily tried and should be consistent with their needs and lifestyles in terms of compatibility. Thus, while marketing managers and m-payment service providers in Ghana celebrate that they can continue to build their critical mass of m-payment users from their reuse willingness, they should design user-friendly systems and always educate customers on how to use the systems. On promoting the benefits and use modalities of m-payment, marketers should use opinion leaders and influencers like peers and family members, especially as this study found that these social groups do have influence on decisions to continuously reuse m-payment. The younger consumers should also be used as opinion leaders to educate older ones, especially as age negatively influences reuse intentions.

By examining the antecedents of m-payment attitudes, use and continuous reuse intention, this study provides key insights for use by technology companies and m-payment services providers who are responsible for designing and promoting m-payment services in a Ghanaian and African context. Out of the six values provided by the CV theory, this study informs technology designers that price, functional and hedonic values are important to Ghanian consumers. For the six technology attributes provided by the DOI, this study reveals that three attributes (complexity, cost and trialability) are behind attitudes formation for consideration. Additionally, the study will help improve practitioner knowledge on m-payment, thereby helping the practitioners to formulate policies and strategies to improve the m-payment systems. This study can serve as attributes and benefits highlighters for promoting m-marketing.

7 Limitations and areas for future research

This study has some limitations that provide areas for future studies. First, the data for the study was only drawn from a university community in Accra, Ghana. As a result, the findings of this study may differ with consumers in other sectors and parts of the country since the lecturers and students surveyed may be more knowledgeable about a study of this nature and provide desirable answers. This usually causes a social desirable bias, which can be overcome in future studies by surveying consumers who are not highly educated but are using m-payment. Future study should obtain data from non-elites so that more hindrances in reusing m-payment can be exposed. In understanding factors influencing consumers and their adoption behaviours, there are more than socio-demographic, consumer, and product-related factors. There could be also marketing and economic factors that need further studies. Also required for further studies are the factors that may hinder the development of positive attitudes and the actual adoption, which the current study may not have examined.

Another limitation relates to the fact that the study was cross-sectional and with a convenience sampling method. Although measures were taken to assess the risk of CMV

associated with convenience cross-sectional data through factor analysing all the study's items, future research should replicate the study with a longitudinal survey and/or qualitative research. This may focus on uncovering more and emerging drivers and barriers of m-payment use over a long period. Longitudinal studies can help uncover changes in environmental and respondents' behaviours over time. For example, the continuing COVID-19 pandemic can push even techno-dummy/resistant customers to use m-payment.

8 Conclusions

This study integrated aspects of the TPB, CV, UTAUT2, and DOI theories to examine how socio-demographic factors (peer, family, age, gender, occupation, and education level), consumer factors (social, functional, hedonic, price and conditional values, behavioural beliefs) and product-related factors (complexity, cost, communication, compatibility and trialability) impact attitudes, adoption and intention to continuously reuse m-payment among Ghanaian consumers. To achieve these objectives an integrated conceptual model was developed, which was tested with 400 respondents recruited from university students and lecturers. It was found that for positive attitude development, value for money was most important in terms of required functional value, the price value and cost involved. To promote the benefits of m-payments to potential users, the opinions of peers and family members will be important.

Overall, the developed conceptual model explained a substantial variance (81.25% of attitudes, 69.9% of adoption and 67.8 % of the intention to reuse m-payment). These high explanatory powers highlight the importance of integrating theories to explain a phenomenon and to provide a more holistic explanation of constructs. The developed and tested conceptual model is the main theoretical contribution for the explanation of consumers' technology adoption behaviour. The practical contributions emanate from exposing CV and product-related factors that build positive attitude, enable adoption, and motivates to continuously reuse m-payment among Ghanaian consumers. Marketing managers, technology developers, banks and other financial institutions will find this study useful.

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Appendix

Construct and source of scale items

Price value	The m-payment services are reasonably priced	Oliveira et al. (2016)
	With regards to the time, I need to travel for cash payment, the use of mobile payment is worthwhile for me	
	Regarding the effort that I make by paying cash, the use of mobile payment is beneficial to me	
	The benefits I get from mobile payment	
	Is worth the charges I pay	
Behavioural beliefs	I see myself capable of operating like m-payment technology	Dilotsotlhe and Duh (2021)
	I have resources to use the m-payment technology	
	I am confident that I m-payment provides better value in terms of time and services	
Complexity	It is difficult to understand how to operate the m-payment system	Dilotsotlhe and Duh (2021)
	The use of m-payment requires a lot of mental effort	
	The use of m-payment is frustrating	
	It is not simple to use m-payment for my business transactions and payment for goods/services	
Costs	The costs involved in the adoption of m-payment are far greater than the expected benefits	Maduku et al. (2016)
	The psychological cost involved in switching from carrying cash to m-payment systems is high	
	The cost of maintaining the use of m-payment is high	
Compatibility	To use m-payment is in line with my current business transactions/payment activities	Dilotsotlhe and Duh (2021)
	I think that using m-payment fits well with the way I like to work	
	Paying with m-payment does no differ much from what I am used to in the past	
Triability	I know where I can go to try the use of the m-payment systems	Moore and Benbasat (1991)
	There is a great deal of opportunity to try the m-payment system services	
	I did not have a problem to try m-payment system services	

Construct and source of scale items (continued)

Attitude	I feel that the claims of the benefits of using the m-payment system are generally trustworthy	Dilotsotlhe and Duh (2021)
	Using m-payment services is beneficial	
	The use of the m-payment services is/will be good for me	
	Using m-payment is reliable and worthwhile	
Adoption	I have switched to mostly using m-payment for goods/services purchases	Dilotsotlhe and Duh (2021)
	I make special efforts to use the m-payment system	
	I am happily using mobile payment services.	
	I do not have a problem using mobile payment services	
Continuous reuse	I intend to make use of the mobile payment, very often	Chalomba et al. (2019)
	I will continue using the mobile payment system.	
	I continue to use the mobile payment for most of my transactional activities	