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Improving Performance, Security and Mobile Money Users Experience: A Study of Service Design

Sunday Adewale Olaleye, Ismaila Temitayo Sanusi, Solomon Sunday Oyelere

Abstract—Mobile technologies have changed the way people interact with their surroundings. Despite the growth of mobile money in Africa, especially in Kenya, Nigeria as a frontier market is lacking behind. Most Nigerians are far from experiencing a cashless economy, and about two-fifths of Nigerians have bank accounts, while four-fifths of Nigerians are ignorant of mobile money services. Quantitative methodology was employed in the study with a focus on mobile money users. The study administered a survey as a hard copy to the community that comprises students and workers in Nigeria with ($n=151$) participants. The study combined performance expectancy, effort expectancy users experience, and security to predict mobile money users' satisfaction, while performance expectancy is the highest predictor of users satisfaction. The insight from this study suggests to mobile money managers to strategize how to optimize the mobile money platform to enhance the mobile money users' experience and satisfaction.

Keywords— Mobile Money, User experience, User satisfaction, Service design

1. Introduction

Mobile technologies have changed the way people interact with their surroundings. Its use has become widespread with astonishing speed all over the world, particularly among the poor. The more mobile phones go to the hands of people who formerly lacked access to financial services, the more the notions of mobile money (Diniz, Porto de Albuquerque, and Cernev, 2011; Wong et al., 2021). Mobile money is a tool that allows individuals to make financial transactions using cell phone technology (Iheanachor et al., 2021). There have been series of literature on mobile money such as comparison among literates and non-literates (Medhi, Gautama, and Toyama, 2009), mobile money for the unbanked (Hughes and Susie, 2007; Pickens, 2009), mobile money for financial inclusion (Myeni et al., 2020; Kim, 2021), mobile money user experience and assessment of mobile money enablers (Olaleye, Sanusi and Oyelere, 2017; Olaleye, Sanusi and Ukpabi, 2018). The spread of mobile money use cut across gender around the world. Mobile money has been growing at a dizzying rate over the past few years, with urban men emerging as the early adopters of mobile money services (Badran, 2017). Women, who make up 50% of their potential market, cannot be ignored if mobile money operators reach scale and impact their operations (GSMA Women Programme, 2012; Riley, 2020; Kim, 2021).

Despite the growth of mobile money in Africa, especially in Kenya, Nigeria as a frontier market is lacking behind. Most Nigerians are far from experiencing a cashless economy, and about two-fifths of Nigerians have bank accounts, while four-fifths of Nigerians are ignorant of mobile money services. In addition, while comparing Nigeria and Kenya in mobile money, Nigerians mobile money use for transactions account for 1.4% of GDP in 2018 while Kenya recorded 44%. Mobile money operators that do not take account of the gender split of their customer base could miss out on a huge segment of the market (GSMA, 2014). In a recent gender study of mobile money by (Suri and Jack, 2016), the impact of mobile money is more pronounced for female-headed households, which appear to be driven by changes in financial behavior. Alexandra (2017) found that female mobile money users have unique needs and characteristics that require new solutions. It was further stressed that women needed more mobile money services than men before feeling confident enough to use the service independently. According to InterMedia (2018), gender often plays a vital role in the uptake and use of new technologies in developing countries, with women lagging behind men. This assertion will be tested in this study to ascertain the gender difference among mobile money users.

This study is interested in the gender, education, and income differences of mobile money users based on performance expectancy, effort expectancy, security, user experience, and user satisfaction variables. These analyses focus on mobile money services design optimization. Therefore, this study contributes to mobile money literature through the adoption of an existing framework, the unified theory of acceptance and use of technology (UTAUT) to study performance expectancy, effort expectancy, user security, user experience, and user satisfaction to learn more about mobile money population's characteristics for businesses. This study illuminates our understanding of how to reach and engage market consumers and strategize for consumer demand future trends. This research developed a conceptual framework linking the relationships between performance expectancy, effort expectancy, security, user experience as an antecedent of user satisfaction of mobile money. This mobile money services conceptual framework can be a viable tool for business strategy and marketing.

This study reviewed related literature to mobile money users' experience and satisfaction in part two. The methodology was explained in part three of the study. The description of the data analysis technique was given in part four, and findings were presented. The last part of this study captures the theoretical contribution, managerial implication, and future direction.

2. Antecedents of mobile money design

2.1. Service design, the case of mobile money

Customers are paramount in service design. Understanding customer's characteristics and needs regarding a particular service determine the successful user experience. Jakob, Simon, Stephen, and Don (2018) affirm that apprehending customers' unique knowledge regarding the use and application of service essential to innovation and success. Besides, service design is vital to innovative services such as mobile money, as it transforms financial service ideas into reality. According to Chris and Christine (2018), "Service design represents a human-centered, reflective learning, iterative approach to the creation of new service offerings." Mobile money users' experience based on human-centered characteristics would serve as a reflective and iterative process to improve the performance of the financial service, especially in Nigeria.

2.2. Mobile Money Services

The clear distinction between products and services is tangibility and intangibility. Rendering services by the Service Provider is growing, and the developing countries are striving to measure up with their counterparts in the developed nations. Despite the presence of the Service Provider in Sub-Saharan Africa, Victor (2014) noticed a gap in financial services which happened to be the critical infrastructural pillar of any growing society. In contrast to the developing countries, in developed economies, the banks' role is to offer financial services to the customers rather than the mobile money operators (Saul, Klaus, Meyer, and Adeline, 2018).

The mobile money concept combines telecommunications and financial services (Victor, 2014). These two key business sectors play a predominant role in job creation and financial inclusion (Lal and Sachdev, 2015). Mobile money stakeholders include the Mobile Network Operator (MNO), Banks, Agent Network, Unbanked and Underbanked customers. The services rendered to the mobile money customers are but not limited to peer-to-peer (P2P) money transfers, bill payment, remittances, retail payments, savings, top-up of telecommunication operator's airtime, school fees payment, employee salaries payment, air tickets payments, insurance premium payment, cash-in, and cash-out services. The mobile money service providers deliver the services through the customer's mobile phone or over the counter (Lal and Sachdev, 2015). Credit payment is another mobile money service that positively influences the Mobile Network Operators and customers (Yan, Moonwon, Chen, and Sriram, 2018) opines that such credit payment service has an opportunity for asymmetric advantages. The first type of service delivery is purely electronic, while the latter requires the physical presence of the mobile money customer in a designated mobile money Agent Network stand.

The ubiquity of mobile phones has attracted diversion in business strategy and investment. It is common in developing countries these days for the traditional money transfer companies, telecommunication operators, banks, and investors to diversify into mobile money services. For instance, MTN, a renowned telecoms operator in Nigeria, has gotten an agent license to set up an agent network. MTN has the potential to kickstart its mobile money operation with its existing mobile users of 67 million and adds 31 million mobile subscribers by 2025 (Kazeem, 2019). Mobile money providers need to move from static to dynamic services to address the complexity of Nigerian society's demographic and psychographic nature. Mobile money services will positively impact the mobile banking systems, local and international mobile money transfer, and mobile commerce payment (Yakub, Bello, and Adenuga, 2013; Talom et al., 2020). This extension of banking systems will also help the petty traders in their daily transactions and bridge the digital divide of rural and urban settlements. Mobile money services delivery is possible through the customer's mobile phone or directly over the counter. These two delivery methods have their advantages and disadvantages, but in the nearest future, it is possible, the over-the-counter delivery method gives way to mobile delivery. For example, the rural dwellers will enjoy over-the-counter delivery more than mobile phone delivery because of their low literacy level. As mobile money keeps growing in Nigeria, there are possibilities of services that Mobile Money Service Providers (MMSP) can render to the customers, such as peer-to-peer money transfer, local and international remittances, bill payment, retail payments, and savings (Lal and Sachdev, 2015). As the customer base of MMSP is expanding, more services offering will be needed for financial intervention.

2.3. Service quality and mobile money quality

In the current mobile commerce scenario, it is evident that the financial firms obtain a competitive advantage by offering proficient services to obtain an increased user experience and customer relationship. Service quality determines customers' loyalty to a particular service, and improving the service quality of mobile banking can help retain customers (Aghdaie & Faghani, 2012; Zhou et al., 2021). Dabholkar (1996) suggested an attribute-based model and an overall effect model as two alternative service quality models for self-service technology. In the attribute-based model, the consumers, through the compensatory process related to self-service technology, are joined to evaluate the service quality. This model recommends a speed of delivery, ease of use, reliability, enjoyment, and control as attributes, which are the key determining factors of expected service quality of the self-service technology such as mobile money (Lee, Fairhurst and Cho, 2013; Dabholkar, 1996). At the same time, the evaluation of service quality in the overall affect model is determined based on two general predispositions, attitude towards using technological products and need for interaction with the service employee (Dabholkar, 1996). Human characteristics such as gender and education can be categorized as the affected model of service quality evaluation. Earlier studies have indicated the gender differential effect on technology adoption and use of self-service; for example, men have shown higher levels of efficiency in internet usage to purchase product and services, better levels of computer self-efficacy, and favorable attitudes for doing online shopping (Lee, Fairhurst, and Cho, 2013).

3. Theoretical Framework

3.1. Performance Expectancy

Performance expectancy (PE) is defined by Venkatesh, Morris, Davis, and Davis (2003) as “the degree to which the user expects that using the system will help him or her to attain gains in job performance.” This situation means that people are more likely to adopt new technologies when they believe that a new system, technology, or platform will help them perform their jobs. The relationship between performance expectancy and the intention to use or the actual use of new technologies has been tested. All hypothesized that performance expectancy predicts the acceptance of IT in different fields, and most of them found evidence for this assumption (Phichitchaisopa and Naenna, 2013; Saul et al., 2018; Lal and Sachdev, 2015). According to Oliveira et al. (2016), the degree to which mobile money applications provide benefits to users to perform activities is referred to as performance expectancy. Recent studies such as Oliveira et al.

(2016), Baganzi and Lau (2017), Mugambe (2017) and Do, et al. (2019) explored the effect of PE on behavioral intention to adopt mobile money and found a positive relationship. Odoom & Kosiba (2020) also found that PE has significantly positive influences on the continuance intentions of mobile money. This study is concerned with the relationship between PE and user satisfaction of mobile money platforms. Thus, we hypothesized that:

H1: Performance expectancy of a mobile money platform will positively influence user satisfaction.

3.2. Effort Expectancy

Venkatesh et al. (2003) defined *effort expectancy* as "the degree of ease associated with the use of the system." He further captured three constructs from other models: perceived ease of use, complexity, and ease of use. Previous studies such as Arman, and Hartati, 2015; Chang, Hwang, Hung and Li, 2007; Phichitchaisopa, and Naenna, 2013; Yan et al., 2018; Kazeem, 2019; Saul et al., 2018) has regularly formulated the hypothesis that effort expectancy positively affects the behavioral intention to use, as well as the actual use of a technique or a technology with their findings supporting for the relationship. However, studies (Mugambe, 2017; Odoom and Kosiba, 2020; Do et al., 2019; Malinga and Maiga, 2020) on mobile money technology indicate the influence of EE on the continuance intention of mobile money was not significant. Kumar et al. (2018) suggest that M-wallet's effort expectancy is positively associated with satisfaction. Therefore, this study tries to probe further to determine if EE of mobile money platform will affect user experience and satisfaction. It is hypothesized that;

H2: Effort expectancy of a mobile money platform will positively influence user experience.

H3: Effort expectancy of a mobile money platform will positively influence user satisfaction.

3.3. Security

Strong security and privacy measures are critical to expanding digital financial systems products to the world's poor and unbanked (Castle et al., 2016). Kolsaker and Payne (2002), Casaló, Flavián, and Guinaliú, (2007), sees security in the handling of private data as it shows the consumer's perception of practices regarding personal data protection carried out by the financial services website and the security of the information system in which these practices are to be found. Therefore, the perceived need for security is defined as one's perceived need for the safekeeping of physical or informational assets (James, Pirim, Boswell, Reithel, and Barkhi, 2008). Shah, Okeke, and Ahmed, (2013) study reveal that users concern about unsecured websites. According to James et al. (2008), an individual's perceived need for security should influence the perception of the device's usefulness. The study of Malinga & Maiga (2020) found that security had little or no significant influence on behavioral intentions to adopt mobile money services. While the research suggests that the users of mobile money services are not concerned with security features, Olaleye et al. (2017) found a positive association of security with the user experience of mobile money. The research of Olaleye et al. (2017) is an indication that security awareness and assurance enhance the user's experience of mobile money. Relatedly, security positively affects user satisfaction with M-wallet usage (Kumar et al., 2018) and mobile payment system (Yang et al., (2015). This study further set to validate the effect of security on user experience and determine its impact on user satisfaction. Thus, we hypothesized that::

H4: Security of mobile money platforms will positively influence its user experience.

H5: Security of mobile money platforms will positively influence its user satisfaction.

3.4. User Experience

The quality of experience is defined as "how a user perceives the usability or degree of satisfaction of a service" (Siris, Konstantino, and Mahesh, 2014). According to Olaleye et al. (2017), the above-stated definition emphasized perception of usability, which could be easy to use or difficult to use, and degree of satisfaction that could be high satisfaction, medium satisfaction, and low satisfaction. It was further stressed that User experience (UX) is all-encompassing as it affects the emotion and attitude of a product or service user. According to

Kujala, Roto, Väänänen-Vainio-Mattila, Karapanos, and Sinnelä, (2011), the goal of UX is to create an overall positive experience for the user through the utility, ease of use, and pleasure provided when interacting with an interface. The UX, either positive or negative, is communicated to the third party in the word of mouth, social media, and mobile devices, which spread the news Olaleye et al. (2017). We suggest that user experience will affect the satisfaction of users of mobile platform based on the assumption of Namisango et al. (2017) considering other factors, it is therefore hypothesized that;

H6: User experience of a mobile money platform will influence user satisfaction.

3.5. User Satisfaction

Tessier, Crouch, and Atherton (1977) defined *user satisfaction* as “ultimately a state experienced inside the user’s head and therefore as a response that may be both intellectual and emotional.” Spärck further stressed (1981) that user satisfaction is paramount and considered the basic concept of information retrieval system evaluation that could not be ignored in any experiment. In any interaction between a user and an interface, achieving user satisfaction is the key in determining the success of a product or a system (Ali, Al-Refai, and Batiha, 2013); user satisfaction is subjective to measure. According to Zahidi, Lim & Woods (2014), User satisfaction results from good UX. The study of Namisango et al. (2017) found that factors such as information quality, system quality, service quality, and net benefits obtained positively correlate to mobile money service use and user satisfaction. This study, therefore, considers PE, EE, Security, user experience influence on user satisfaction in the mobile money system.

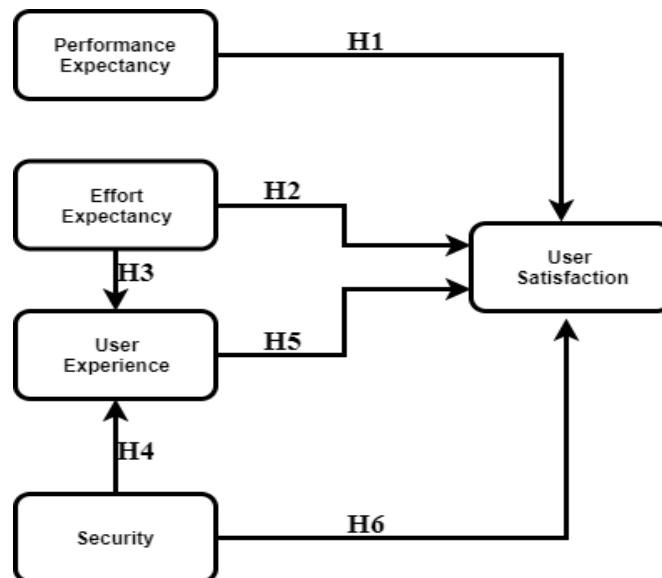


Fig. 1. Conceptual Framework

4. Methodology

4.1 Measurement

This study used quantitative research methodology to generate knowledge and understand mobile money users' essentials. The study examined how mobile money affected its users in a developing country setting. It used a questionnaire to measure mobile money user's opinions regarding mobile money service design in connection with its performance and security. The questionnaire items were derived from literature as discussed in the literature and conceptual framework section. The constructs used in the study were adapted as follows: User Experience (UE) and user satisfaction were adapted from [38] López-Nicolás, Molina- Castillo, and Bouwman (2008), [39] Wu, (2011), Effort Expectancy (EE) and Performance Expectancy (PE) were adapted from [40] Luarn and Lin (2005), [41] Venkatesh and Zhang, (2010) and Security (SR) was adapted from [42] Arun, Paul Brown, and Xinlin (2009). A seven-point Likert-type scale ranging from 1 "strongly disagree" to 7 "strongly agree" was employed in the instrument used to elicit information from the respondents.

4.2. Questionnaire development

This study sample constitutes the rural financially exclusive population currently using mobile money services in Nigeria as a substitute for conventional banking transactions. The study refines the existing scales such as performance expectancy and effort expectancy from the scales used in the studies of [40] Luarn and Lin (2005); Venkatesh and Zhang, (2010); [43] Foon and Fah, (2011), [44] Jiraporn, Mathupayas and Atcharawan (2011) user experience and user satisfaction from Davis [45] Davis, F. (1989), [46] Igbaria, Zinatelli, Cragg, and Angele. (1997), [25] Venkatesh et al., (2003), [47] Venkatesh, and Davis, (2000), [48] Chauhan, (2015) and the scale of security from [42] (Arun, Paul and Xinlin, 2009) (Table 1). The study also includes the demographic information, mobile money knowledge, and mobile money use of the rural mobile money segment. This study administered a paper survey to the mobile money services users in the rural part of South West Nigeria for one month between February and March 2017. Out of 250 questionnaires distributed, only 151 responses were found helpful after the cleaning processes due to incomplete copies and unengaging responses.

The survey participants comprised 81 males (54%) and 70 females (46%). Besides, 54% of the respondents are single, and 46% are married. 56% of the respondents have bachelor's degrees, 29.8% possess high school diplomas, 11% possess master's degrees, 2% doctorate, and less than 1% have no formal qualification. Most of the respondents (56%) reported student as their occupation, 12% work in the public sector, 9% work in the teaching profession, another 9% work in the private sector, 8% are self-employed, 1% each as armed forces and researcher and 4% did not specify their occupation. The respondents that earn less than ₦100000 are 72%, 18% respondents earn more than ₦100000 but less than ₦200000, 7% earn between ₦300001 to ₦400000, 3% earn between ₦400001 to ₦600000. At the time of this study, 1 US dollar is equivalent to ₦362. Furthermore, 96% of the respondents indicate that they understand mobile money, and only 4% responded otherwise. Most of the respondents (52%) learn about mobile money through the bank, 18% through friends, 14% through telecommunication providers, 6% through mass media such as newspaper, television, radio, and 10% learn about mobile money friends. Similarly, 82% of the respondents indicated that they are registered with mobile money operators in Nigeria, while only 18% indicated otherwise. The respondents indicated that they patronize different mobile money operators in Nigeria. 45% of the respondents are registered with GTBank, the mobile money operator. In comparison, 22% of the respondents operate with FirstMonie, mobile money operator, 9% respondents with Stanbic IBTC mobile money operator. Besides, 6% of respondents operate with Ecobank mobile money operator, 5% with Fortis MFB/MTN operator, 4% respondents operate with each of eTranzact PocketMoni and Zenith bank easy money operators respectively, and lastly, 5% respondents indicated other mobile money operators.

There was a growing interest in mobile money as 75% of respondents indicated that they registered with mobile money operators between 2014 and 2016, compared to only 25% of those registered between 2011 and 2013. Lastly, most of the participants reported the following issues as reasons for non-registration for mobile money:

- safety issues (34%)
- reliability issues (28%), lack of need for mobile money services (25%)
- the lack of information on mobile money services (13%)

The study employed the mobile money use questions for further data analysis. For instance, “how often do you use your mobile money service” under mobile money use questions with five Likert scales of “I have never used it,” “at least once a month,” “at least once a week,” “not more than three times in a year” and “at least once a day” was processed with SmartPLS for interaction effect analysis. The complete data was divided into two groups of low mobile money users and high mobile money users. The SmartPLS generates interaction effect values which were used to plot two-way interactions with excel templates according to the procedures of (Aiken, West, and Reno, 1991; Dawson, 2014). We used a two-step approach recommended by Anderson and Gerbing (1988) for the data analysis. The first step involves the measurement model, and the second step tests the structural relationships among the constructs.

Table 1. Source of the instrument (The italicize items did not reach the thresholds)

| Construct and Source | Items |
|--|---|
| Performance Expectancy Luarn and Lin (2005); Venkatesh and Zhang (2010); Foon and Fah (2011); Sripalawat, Thongmak, and Ngramyarn, (2011). | <ul style="list-style-type: none"> ▪ <i>Using mobile money would save my time.</i> ▪ <i>I can use mobile money in anyplace.</i> ▪ I would find mobile money useful ▪ Mobile money is a useful technology for me |
| Effort Expectancy Luarn and Lin (2005); Venkatesh and Zhang (2010); Foon and Fah (2011); Sripalawat, Thongmak, and Ngramyarn, (2011). | <ul style="list-style-type: none"> ▪ <i>Learning to use mobile money is easy for me.</i> ▪ Becoming skillful at using mobile money devices is easy for me ▪ <i>Interaction with mobile money platform is easy for me.</i> ▪ Mobile money system would be flexible for me to utilize |
| User Experience Davis (1989); Wu (2011); Igbaria et al., (1997); Venkatesh et al., (2003); Venkatesh and Davis, (2010); López-Nicolás et al., (2008), Chauhan, (2015). | <ul style="list-style-type: none"> ▪ <i>I believe m-money is easy to use.</i> ▪ I believe m-money is simple and understandable for performing transactions ▪ I believe that the use of m-money is trouble-free ▪ I believe mobile money system is fast to use for transactions |
| Security Arun, Brown, and Tang (2009) | <ul style="list-style-type: none"> ▪ <i>I feel comfortable that mobile money technological structures adequately protect me from problems.</i> ▪ I feel comfortable that encryption and other technological advances of mobile money systems make it safe for me to do transaction on the Internet ▪ Mobile money systems provide a safe environment to transfer money ▪ <i>Secured mobile money platform allay me fear of cyber theft.</i> |
| User Satisfaction Davis [45]; Wu (2011); Igbaria et al., (1997); Venkatesh et al., (2003); Venkatesh and Davis, (2010); López-Nicolás et al., (2008), Chauhan, (2015) | <ul style="list-style-type: none"> ▪ <i>I have a favorable experience using m-money.</i> ▪ <i>I believe that the use of m-money is beneficial.</i> ▪ I like the idea of transferring money through m-money platform ▪ I am satisfied with mobile money features |

Table 2. Confirmatory factor analysis (CFA) result for the mobile money model

| Constructs and measurement items | Standardized loadings | CR | AVE |
|---|------------------------------|-----------|------------|
| Performance Expectancy | | 0.76 | 0.62 |
| PE1 | 0.64 | | |
| PE2 | 0.91 | | |
| Effort Expectancy | | 0.84 | 0.73 |
| EE1 | 0.91 | | |
| EE2 | 0.79 | | |
| User Experience | | 0.72 | 0.47 |
| UX1 | 0.73 | | |
| UX2 | 0.66 | | |
| UX3 | 0.66 | | |
| Security | | 0.78 | 0.65 |
| SE1 | 0.62 | | |
| SE2 | 0.96 | | |
| User Satisfaction | | 0.75 | 0.61 |
| US1 | 0.78 | | |
| US2 | 0.77 | | |

4.3. General Model Quality Criterion

Table 3. Common Methods Bias - Variance Inflation Factors (VIF) Values

| | Effort Expectancy | Performance Expectancy | Security | Users Experience | Users Satisfaction |
|-------------------------------|--------------------------|-------------------------------|-----------------|-------------------------|---------------------------|
| Effort Expectancy | | | | 1.016 | 1.098 |
| EE2 | 1.276 | | | | |
| EE4 | 1.276 | | | | |
| Performance Expectancy | | | | | 1.191 |
| PE3 | 1.069 | | | | |
| PE4 | 1.069 | | | | |
| Security | | | | 1.016 | 1.062 |
| SR2 | 1.161 | | | | |
| SR3 | 1.161 | | | | |
| Users Experience | | | | | 1.133 |
| UE2 | 1.169 | | | | |
| UE3 | 1.114 | | | | |
| UE4 | 1.053 | | | | |
| Users Satisfaction | | | | | |
| US3 | 1.047 | | | | |
| US4 | 1.047 | | | | |

The reliability of the model was confirmed, as the values of Composite Reliability were higher than 0.7. The Average Variance Extracted (AVE) value is greater than 0.5 except for users' experience marginal result with 0.47. All the items loaded well and above 0.5 (Table 1). The square root of Average Variance Extraction (AVE) was showcased in Table 2. The coefficient between security and user experience was 10.7%, while the variance explained in the general model was 37%.

Table 4. Latent Variable Correlations

| Construct | EE | PE | SR | UE | US |
|------------------|-------------|-------------|-------------|-------------|-------------|
| EE | 0.78 | | | | |
| PE | 0.265 | 0.80 | | | |
| SR | 0.112 | 0.254 | 0.86 | | |
| UE | 0.256 | 0.324 | 0.231 | 0.80 | |
| US | 0.322 | 0.567 | 0.279 | 0.238 | 0.77 |

*The square root of AVEs (shown in bold diagonal) and factor correlation coefficients

5. Result and discussion

5.1. General Model (Study 1)

SmartPLS 3.0 software was used in this study to test the hypotheses of partial least square (PLS) path modeling. The measurement and path models are tested simultaneously by PLS. A structural equation modeling (SEM) approach aids in analyzing the research models comprising multiple constructs with multiple items. Figure 2 describes the hypotheses tested, including path coefficients and variance explanation. As evident in Figure 2, Performance Expectancy has a positive impact on user satisfaction, with $PE \rightarrow US \beta = .48$ and $t = 6.12$ and Effort Expectancy is associated with user satisfaction, with $EE \rightarrow US \beta = .18$ and $t = 2.43$, Effort Expectancy is associated with user experience, with $EE \rightarrow UE \beta = .23$ and $t = 2.57$. Security on mobile money platforms will positively affect user experience; $SR \rightarrow UE \beta = .21$ and $t = 2.78$ and Security is positively associated with user satisfaction, $SR \rightarrow US \beta = .14$ and $t = 2.00$. The relationship of users' experiences and user's satisfaction, $UE \rightarrow US \beta = .03$ and $t = 0.05$, was not found significant in this study. As a connector of user satisfaction, PE is the most influential user experience with mobile money.

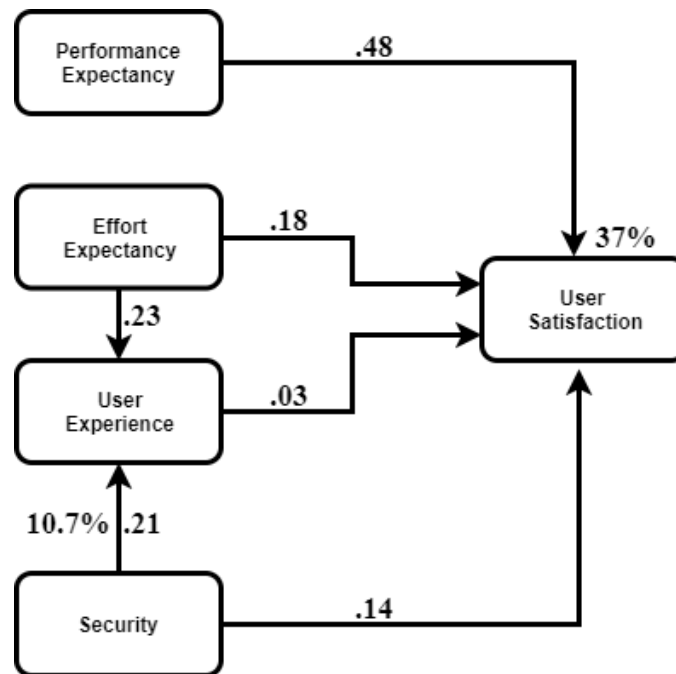


Fig. 2. Conceptual Framework and Tested Hypotheses

Table 5: Standardized path coefficients for Mobile Money General Model

| HYP | Path | M | SD | T-Test | P-value | HYP Confirmed |
|-----|---------|------|-------|--------|---------|---------------|
| H1 | PE-> US | 0.48 | 0.079 | 6.105 | 0.000 | Yes |
| H2 | EE-> US | 0.18 | 0.073 | 2.431 | 0.015 | Yes |
| H3 | EE ->UE | 0.23 | 0.09 | 2.574 | 0.01 | Yes |
| H4 | SR ->UE | 0.21 | 0.074 | 2.779 | 0.005 | Yes |
| H5 | UE->US | 0.03 | 0.075 | 0.052 | 0.959 | No |
| H6 | SR-> US | 0.14 | 0.068 | 1.996 | 0.046 | Yes |

* Two-tailed hypothesis. Significant at $p < .01$

Table 6: Gender Multigroup path coefficients and corresponding hypothesis results

| HYP | Path | M (f) | M (m) | SD (f) | SD (m) | T(f) | T(m) | P(f) | P(m) |
|-----|----------|-------|-------|--------|--------|------|------|-------|-------|
| H1 | PE -> US | 0.53 | 0.52 | 0.11 | 0.12 | 4.60 | 4.35 | 0.00 | 0.00 |
| H2 | EE -> US | 0.17 | 0.19 | 0.11 | 0.12 | 1.43 | 1.70 | 0.154 | 0.088 |
| H3 | EE->UE | 0.03 | 0.46 | 0.16 | 0.08 | 0.21 | 5.50 | 0.837 | 0 |
| H4 | SR ->UE | 0.28 | 0.18 | 0.14 | 0.11 | 1.88 | 1.68 | 0.06 | 0.092 |
| H5 | SR -> US | 0.09 | 0.16 | 0.11 | 0.11 | 0.85 | 1.52 | 0.398 | 0.129 |
| H6 | UE ->US | -0.02 | -0.00 | 0.11 | 0.11 | 0.27 | 0.02 | 0.79 | 0.984 |

Table 7: Education and income multi-group path coefficients (1.96 thresholds, < is not a good result)

| HYP | Path | High Education | p-Values (High Education) | Low Education | p-Values (Low Education) | High Income | p-Values (High Income) | Low Income | p-Values (Low Income) |
|-----|----------|----------------|---------------------------|---------------|--------------------------|-------------|------------------------|------------|-----------------------|
| H2a | EE -> UE | 1.795 | 0.073 | 1.480 | 0.140 | 2.157 | 0.031 | 0.967 | 0.334 |
| H2b | EE -> US | 1.443 | 0.150 | 0.215 | 0.830 | 1.135 | 0.257 | 0.591 | 0.555 |
| H2c | PE -> US | 1.234 | 0.218 | 4.890 | 0.000 | 1.239 | 0.216 | 4.692 | 0.000 |
| H2d | US -> UE | 1.519 | 0.129 | 0.552 | 0.581 | 1.450 | 0.148 | 0.722 | 0.471 |
| H2e | SR -> US | 3.414 | 0.001 | 0.668 | 0.504 | 3.643 | 0.000 | 0.664 | 0.507 |
| H2f | UE -> US | 0.237 | 0.813 | 2.073 | 0.039 | 0.002 | 0.998 | 2.237 | 0.026 |

5.2. Mobile Money Gender Multi-Group Model Assessment (Study 2)

The study embarked on multigroup analysis with SmartPLS Bootstrapping to confirm the gender differences of mobile money in a developing country context. The result reveals use differences in male and female only for PE → US path coefficient $\beta = .53$ and $t = 4.60$ for female mobile money users and PE → US $\beta = .52$ and $t = 4.35$ for male mobile money users. Also, the path coefficient of EE → UE $\beta = .46$ and $t = 5.50$ was only significant for male mobile users. All the other path coefficients in the multigroup analysis were not significant (see Table 3).

5.3. Education and Income Multi-group Model Assessment (Study 3)

The result indicated differences in education and income levels according to the path coefficients presented in Table 4 to ratify the education and income differences as an essential factor for adopting mobile money in developing countries. Effort expectancy of a mobile money platform will positively influence the experience of a higher income earner of mobile money users than the lower-income earner (EE → UE, $t = 4.35$, p-values 0.031). Similarly, the performance expectancy of the mobile money platform will positively influence the satisfaction of low educated, mobile money user far more than the user with lower education (PE → US, $t = 4.89$, p-values 0.000). Also, the low-income earner was significant for (PE → US, $t = 4.69$, p-values 0.000). Higher educated was different from low educated mobile money users (SR → US, $t = 3.41$, p-values 0.001) while high-income earner was different from low-income earner (PE → US, $t = 3.64$, p-values 0.000). However, the low-educated is different from the high-educated mobile money user (UE → US, $t = 2.07$, p-values 0.039). At the same time, the low-income earner is different from the high-income mobile money user (UE → US, $t = 2.24$, p-values 0.026). The path of (EE → US) and (US → UE) was not significant for highly educated, low educated, high income, and low-income earners in this study. Security of mobile money is important for user satisfaction of higher education holders than lower education holders.

In the original model, the user's experience did not predict user satisfaction significantly. However, in Study 3, the low educated and low-income earners believed that a modest mobile money platform could enhance mobile money users' experience, turning into user satisfaction. This study shows that low educated and low-income earners believe that the mobile money system will give them satisfaction. Also, the high-income earners think that mobile money's ease could add value to their user experience. In contrast, the highly educated and high-income earners believed that a secured mobile money platform could afford them a user's satisfaction.

5.4. Interaction Effects (Study 4)

The early study recommends that researchers consider each user's amount of exposure to the product under consideration in terms of duration and frequency of use. This study took a cue from Borsci, Federici, Bacci, Gnaldi, and Bartolucci (2015) and used the frequency of mobile money services as an interaction of user satisfaction. The study used a product indicator approach with 5000 subsamples to better examine the interaction effects of Effort Expectancy and User's satisfaction through the frequency of mobile money services use. The result shows $EE \rightarrow US, t = 4.07$, $Frequency \rightarrow US, t = 0.08$, $UE \rightarrow US, t = 0.09$ and $EE*FR \rightarrow US, t = 3.20$. The results established the interaction effects of user satisfaction and mobile money services frequency and showed a weak interaction effect $f = 0.06$ (Figure 3). The mobile money user's satisfaction level determines the high and low frequency of mobile money services users.

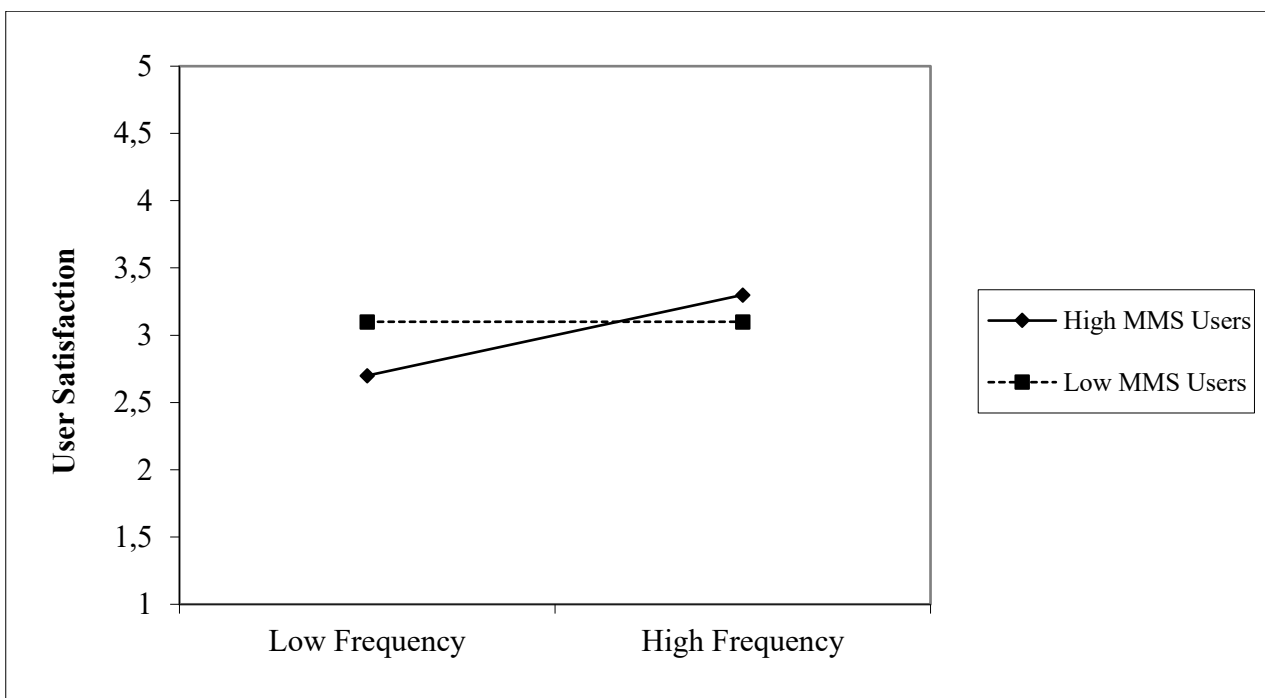


Fig. 3. Interaction Effects Two-tailed significance levels (** $p < 0.001$; * $p < 0.01$)
 f Thresholds: 0.02 - 0.15 weak; 0.15 - 0.35 moderate effect; > 0.35 strong effect
Note: High MMS Users (High Mobile Money Service Users)
 Low MMS Users (Low Mobile Money Service Users)

5.5 Discussion

Mobile money services are expanding from the urban to the rural areas of Nigeria, and the growth aims to increase financial inclusion and reduce financial exclusion. Six years ago, Lal and Sachdev (2015) remarked on the limitation of the mobile money services success in emerging markets, but today the story has changed. Despite the improvement in mobile money services, needs transformation for performance, security to prevent frustrating user experience and lack of engagement. The study probe into the influence of performance expectancy, effort expectancy, security and user experience on mobile users' satisfaction since the users of mobile money system are playing an important role in mobile money business success. For mobile money users to be free from the uncertainty of money transactions, the mobile money providers

need to build a mobile money platform with security features that can sustain the confidence of the mobile money users. In addition, they need to make the mobile money platform operate the platform with less effort and for the users with less complicating design and users' friendly interface. This study contributed to the ongoing discussion on mobile money services. It established the performance predictors of user's satisfaction, effortless attribute of mobile money user's experience, security assurance that builds user's confidence, experience, and satisfaction. Unexpectedly, mobile money user's experience did not support its user's satisfaction. This result is consistent with the study of (Olaleye et al. 2018). The mobile money users in Nigeria are yet to have a holistic mobile money services experience.

6. Insights and Limitations

6.1 Theoretical Insights

User experience is not a predictor of user satisfaction because usability, which could be difficult for the user while using the mobile money platform, is not satisfied. Nevertheless, this study contributes to the information systems literature with a focus on mobile money. First, a combination of performance expectancy, effort expectancy, and security positively predicts the user's experience of mobile money in the Nigerian context. In contrast, performance expectancy is the highest predictor of user satisfaction. The model proposed in this study extends the theory of unified theory of acceptance and use of technology (UTAUT) in mobile money service design by combining information system and mobile money usage behavior with security. This study reveals performance expectancy, effort expectancy, and security as the responsible factors for user experience and user satisfaction of mobile money in emerging markets of Africa. These factors have a direct and indirect relationship with user satisfaction. Second, there are gender differences between the way the male and female users use mobile money in this context. It is imperative to take cognizance of gender, according to (Kim 2021). Third, this study opens up insights into the relevance of education and income to mobile money growth, an excellent asset for profiling, targeting, and segmentation. Fourth, this study opens interaction effects between effort expectancy, user's experience, and user's satisfaction and shows how the frequency of mobile money services use to strengthen the relationship between effort expectancy and user's satisfaction. This relationship implies that the simple the mobile money managers keep their mobile money service platform, the higher the frequency of mobile money users' patronage. The mobile money managers should leverage this research result to transform the mobile money platform based on the demographics of gender, education, and income. This theory expansion will guide future researchers in the domain of mobile money.

6.2 Managerial Insights

Mobile money managers can leverage gender insights from this study in two main ways. The mobile money managers can use it to understand the different usage patterns of male and female customers. This type of analysis is key to identifying the barriers to women adopting the mobile money service and developing strategies to include them. Two, this study suggests to managers to increase women's uptake of their services. Once operators understand how women are currently using mobile money, they can use gender data to measure their tactics to drive usage, which is a good starting point. Third, this study shows the importance of demographics of education and income and how they differ in the mobile money context. There is a difference between highly educated and low educated mobile money users and similarly to high income and low-income earners of mobile money users. This result gives a better understanding of mobile money user's experience and satisfaction. The insight from this study suggests to mobile money managers to strategize how to optimize the mobile money platform to enhance the mobile money users' experience and satisfaction. The mobile money managers can use the results of this study to clear misconceptions of mobile money services in a developing setting, simplified the mobile money channel. Also, the managers can introduce mobile money multifaceted models that will harmonize all the mobile money stakeholders and adopt a market intelligence for competitive advantage.

6.3 Limitations

Although the quantitative research approach used in this study tends to be relatively easy to analyze, it may not be sufficient to understand the overall context of mobile money users in Nigeria. Users' willingness to transact through mobile services may be influenced by contextual factors such as the place of transaction, environment, language, events surrounding the use of mobile money, which are beyond the scope of the current study. Moreover, the quantitative data may not be adequately robust to explain the complexities and issues surrounding the use of mobile money in terms of those factors considered in this research (performance, effort, security, user experience, and satisfaction). Another limitation of this research is that the findings cannot be generalized to the entire study population due to the small sample size. It could have been more rigorous to conduct a mixed-method study with the same research set up to better understand the mobile money user's experience and improve the sample's generalizability. Future researchers should expand this study with large sample size and collect mobile money users' data across Nigeria states for rigorous comparative analysis. It may be interesting to replicate this study in other Africa countries to understand how the outcome of this study is comparable in other country's contexts.

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