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Towards a Usability Engineering Based Analysis of Mobile Payment Platforms Among Bank Customers in Ghana.

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ABSTRACT

The ever-changing world of technology has necessitated the development of platforms aimed at easing the burden of everyday task. Nowhere is this more evident than in the realm of mobile banking. Sometimes referred to as mobile wallet, mobile payment or mobile money, it generally denotes a technology that allows payment services to be carried out via a mobile device under the guidance of a financial regulatory body. Different mobile money platforms exist around the world. Each platform is designed to serve the financial needs of different consumers from different jurisdictions. There is also the security and ease of use factor that makes it attractive to a huge section of the public. Mobile transactions have provided a level of easiness in funds transfer that has never been seen. Transactions that previously required physically commuting to banks can now be done by the push of a button. However, with this rapid rise in patronage has come the question of usability. Regarding this research, usability engineering is examined in line with how balance, pattern, scale and visual weight influences the choice of which mobile money platform a user selects to transact business. Using a sample size of 800 mobile money users spread across Accra, the findings is used to engineer a framework for developing mobile money platforms.

Keywords: cashless economy, mobile money, design aesthetics, usability, user experience

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1. INTRODUCTION

Technological advancement from the nineteenth century to the contemporary world has witnessed great strides in the area of telecommunication, electronic funds transfer and many more. This has been driven by a voracious quest to create systems that will help in carrying out everyday task with ease. Tasks that have always demanded manpower or additional effort have now been taken over by platforms capable of performing similar activity with less effort. Vital among the creations is Mobile Money. "Mobile Money is a service that allows people to receive, store and spend money using a mobile device" (GSMA, 2010). Its emergence and growth has created an ecosystem that is increasingly spurring economic growth and job creation (Collymore, 2016). The service recorded tremendous growth of 737.4% in volume of transaction from 2012 to 2016 (BOG, 2017).

Mobile transactions have provided a level of easiness in funds transfer that has never been seen. Transactions that previously required physically commuting to banks can now be done by the push of a button. However, with this rapid rise in patronage has come the question of usability. "Usability is a quality attribute that assesses how easy user interfaces are to use and outlines methods for improving ease-of-use during the design process" (Nielsen, 2012). Usability occupies a central role during design and development of any system because user experience is accentuated above any other requirement (Tan et al, 2009). The moment a user interacts with a system, their experience is used as a yardstick against which future systems will be judged.

Thus, investigating Mobile Money platforms in Ghana to unearth the impact of aesthetics on choice of which platform is adopted for business transaction is the motivation behind this research. Researching "Usability engineering-based analysis of mobile money platforms among bank customers in Ghana" is within the purview of software usability which is one of the disciplines of Information Technology. Information Technology is a body of knowledge that comprises of Application Development, Human Computer Interaction, Database Administration, Network Engineering and Systems Analysis. Usability Engineering is under the broad spectrum of Human Computer Interaction within the field of Information Technology. It encapsulates how humans interact with computers. While it previously centered on computers, it has now grown to include diverse forms of information technology design.

"Human-Computer Interaction (HCI) is an area of research and practice that emerged in the early 1980's initially as a specialty area in computer science embracing cognitive science and human factors engineering" (Soegaard and Dam, 2014). Originally researchers within the field of HCI fixated on improving the usability of desktop computers. However, with the growth of internet technologies and mobile devices, the use of computers has moved toward adoption of the new mobile ecosystem. With this newly developed mobile environment has come the mobile payment infrastructure as a way to handle payments in the 21st Century. Financial institutions that were initially reluctant to join the mobile payment fraternity became the drivers of the technology as a way to promote financial inclusion in attaining the sustainable development goals of signing up many unbanked Ghanaians both in the rural and urban centres. Getting all the unbanked to participate in the financial sector through mobile payment systems has not been without challenges. Regardless of these difficulties the service has recorded tremendous growth within the past five (5) years as reported by the Bank of Ghana (2017).

With Mobile Money now playing a key role within the financial sector in Ghana, it has become more pressing to ensure that the system is rendering the service to users for which it was designed. Finding out what drives a user to adopt a particular mobile money platform or application will help in ensuring that future platforms either incorporate or exclude certain features that users do not want which will go a long way to boost its overall usage. That is, analysing mobile money usability through the lens of design aesthetics is key to ensuring the development of robust platforms.

Having businesses increasingly demand mobile money payments instead of physical cash has shown the growing importance of investigating this medium to help develop robust payment platforms. Studying the impact of aesthetics on the choice of mobile money platform in Ghana is an area yet to be explored in detail. The ever-growing domain of mobile money as the medium for business transaction in Ghana has necessitated in-depth research into the factors that determine which mobile money platform a user adopts and the reasons behind it. This will help in the development of highly usable mobile money platforms that are robust in security and also provide great user experience.

2 RELATED BACKGROUND

Relatively little is known about design aesthetics and the factors that influence choice of mobile money platform in Ghana. This is more evident in the domain of mobile payments as the go-to technology capable of eliminating many challenges with business transaction. However, it is an area that has not been looked at thoroughly when it comes to investigating the factors that influence a user's choice on which mobile payment system is adopted in business transaction. Current literature looks at design aesthetics in two ways: that is as the objective features of a stimulus (ex: layout, colour-combination) or as the subjective reaction to specific product features. Making a distinction between the two definitions, as an objective feature of a stimulus refers "to the design aspects of product like form, tone colour and texture" (Postrel, 2003) while as a subjective reaction refers to "the degree to which a person believes that the product is aesthetically to the eye" (Van Der Heijden, 2003).

The current status of research into design aesthetics and usability is mainly centered on investigations into specific design factors such as surface attributes and a look at individual characteristics such as age, cultural background and the role of gender (Crilly et al, 2004). Given the role of aesthetics in product development, it raises the need to examine the influence design aesthetics have in usability engineering and mobile money payment systems in Ghana. Every financial system needs a well-functioning payment structure capable of handling huge volumes of transactions necessary for the stability and growth of its economy. "Mobile money is a service that allows people to receive, store and spend money using a mobile device" (GSMA, 2010). Having an "efficient payment system facilitates timely completion of financial transactions which enhances job creation, economic growth and improved standard of living" (BOG, 2017).

Before the introduction of mobile money in Ghana, business transactions often required parties to physically meet or use the banking system to complete transaction. This mode of doing business came with its downsides. Among the challenges were delayed payments, unsecured transactions as well as time and resource consuming. The need to find fast, affordable mode of transacting business through secured means led to the introduction of the mobile money system. Using mobile money as a means of payment introduced benefits such as convenience, speed, flexibility and affordability (GSMA, 2013).

“Users are more tolerant of minor usability issues when they find an interface visually appealing” (Moran, 2017). Alongside the direct economic impact of the mobile money system, it has broken down trade inhibitions through the removal of impediments thereby increasing efficiency and encouraging transparency. The continuous growth of mobile money platforms and applications has brought with it the need to investigate potential usability problems to find out what goes into the decision-making process of users on which platform is used in transacting business and why.

Currently, little is known about what goes into the choice of a particular mobile money platform over the another during business transactions. The generally held view is that cost of transfer charges is the main factor on choice of a particular platform over the other. Other factors such as the aesthetics of the platform or application has the tendency to mask potential usability problems. Aesthetics is broadly defined as the core design elements that underscore a software or application’s pleasing qualities (Moran, 2017). This research delves into different factors such as education, poverty level, access to mobile devices, computer literacy and their impact on how a mobile money platform or application is chosen over another. In addition to these factors, design structures like layout, navigation, colour-combination, pattern, scale, shape and visual weight are examined in the choice of which mobile money platform an agent, aggregator or ordinary user uses to transact business. The aesthetic-usability effect propounded by Kurosu and Kasjimura in 1995 is also examined to ascertain “users’ tendency to perceive attractive products as more usable”.

Previous studies conducted on the subject often focus on the usability of different applications without looking at the role of aesthetics in user documentation of likely usability problems. More significant the fact that this study looks at usability engineering from the perspective of how aesthetics determines the choice of which mobile money platform is used in transacting business in Ghana. Usability now plays a central role within the ecosystem of application development. In lieu of its growing importance ensuring that applications are free from embedded usability problems has taken on new meaning. The contemporary world is transacting business online and electronically at an ever-increasing pace. This study first delves into the domain of usability and investigates the correlation between design aesthetics and the choice of which mobile money platform is used for business transaction. As already mentioned in the preceding paragraphs e-commerce is one of the main forms of business driving the push for mobile money payment systems.

Interactive systems fail to provide users with great user experience as a result of neglecting core usability principles in their design. This study focuses on how to solve this problem by investigating the influence of design aesthetics on the use of applications while focusing on how it applies to the choice of mobile money payment platforms in Ghana. Nearly all prior-studies employed user-centered methods like usability testing, evaluator-based approach like heuristic evaluation or software- centric technique like Google Analytics in their researches. None looked at investigating the influence of design aesthetics on the choice of mobile money platforms through the lens of usability engineering. This study therefore reviews previous literature into the subject of usability engineering, design aesthetics, electronic payment services and mobile money in Ghana to draw a distinction and correlation between application and software use and design aesthetics.

3. THE RESEARCH FIELD

Researching “the influence of design aesthetics on choice of Mobile Money platform in Ghana” is within the purview of Usability Engineering which is one of the disciplines of Information Technology. Information Technology is a body of knowledge that comprises of Application Development, Human Computer Interaction, Database Administration, Network Engineering, Systems Analysis etc. Usability Engineering is under the broad spectrum of Human Computer Interaction within the field of Information Technology. It encapsulates how humans interact with computers. While it previously centered on computers, it has now grown to include diverse forms of information technology design. “Human-Computer Interaction (HCI) is an area of research and practice that emerged in the early 1980’s initially as a specialty area in computer science embracing cognitive science and human factors engineering” (Soegaard and Dam, 2014). Originally researchers within the field of HCI fixated on improving the usability of desktop computers. However, with the growth of internet technologies and mobile devices, the use of computers has moved toward adoption of the new mobile ecosystem.

With this newly developed mobile environment has come the mobile payment infrastructure as a way to handle payments in the 21st Century. Financial institutions that were initially reluctant to join the mobile payment fraternity became the drivers of the technology as a way to promote financial inclusion in attaining the sustainable development goals of signing up many unbanked Ghanaians both in the rural and urban centres. Getting all the unbanked to participate in the financial sector through mobile payment systems has not been without challenges. Regardless of these difficulties the service has recorded tremendous growth within the past five (5) years as reported by the Bank of Ghana (2017). With Mobile Money now playing a key role within the financial sector in Ghana, it has become more pressing to ensure that the system is rendering the service to users for which it was designed. Finding out what drives a user to adopt a particular mobile money platform or application will help in ensuring that future platforms either incorporate or exclude certain features that users do not want which will go a long way to boost its overall usage. That is, analysing mobile money usability through the lens of design aesthetics is key to ensuring the development of robust platforms. Having businesses increasingly demand mobile money payments instead of physical cash has shown the growing importance of investigating this medium to help develop robust payment platforms.

Studying the impact of aesthetics on the choice of mobile money platform in Ghana is an area yet to be explored in detail. The ever-growing domain of mobile money as the medium for business transaction in Ghana has necessitated in-depth research into the factors that determine which mobile money platform a user adopts and the reasons behind it. This will help in the development of highly usable mobile money platforms that are robust in security and also provide great user experience.

3.1 Subject Area of Study

“The subject area of a study refers to the specific aspect of a broader research field” (Natasi et al, 2007). Usability Engineering remains the central focus of this research. Researching usability engineering based analysis of mobile money platforms permits the collection, analysis and interpretation of data on how Developers employ aesthetics to complement usability. Thus, analysing aesthetics as a core design principle helps to ascertain its impact on the choice of mobile money platform that users engage for business transaction.

Narrowing this research to design aesthetics within the broader framework of usability has taken on more significance with the rapid and continuous growth of mobile money payment systems. With the more traditional means of financial engagement being eroded by the introduction and acceptance of mobile money, this research has become more significant. Results derived from this research will be used to inform future versions of mobile payment systems in order to ensure that future platforms are usable and provide great user experience.

The quest to ensure that a considerable portion of Ghanaians adopt electronic payment systems like Mobile Money to transact business brings into focus the usability and design features aspect of it all. This is because users will immediately reject or abandon a product if it is unusable or provides a poor user experience. Due to this, usability continues to play a central role in every technological innovation that seeks wide acceptance. This research is driven by the growing adoption of mobile payment systems for financial transactions and the need to ensure that these new mobile payment platforms are without usability problems. In doing this, the role of design aesthetics is evaluated to ascertain whether it plays a role in users adopting or rejecting a particular platform. This has become more important in the contemporary world where global reports show an ever-increasing mobile money adoption across different jurisdictions.

“In 2020, the number of registered mobile money accounts grew by 12.7% globally to 1.21 billion as a result of regulators implementing more flexible processes and relaxing on-boarding requirements to make it easier to open an account” (GSMA, 2021). With global daily transactions eclipsing \$2 billion, ensuring that users are getting value for money in their engagement of these platforms is vital. It is for this reason that this study emphasizes the role of usability in software and application development. Finding out the factors that account for why a user chooses one mobile money platform over another will help develop better and improved mobile payment systems that is embraced by many thereby increasing the financial inclusion targets of Sustainable Development Goals (SDG). The importance of investigating design aesthetics on choice of mobile money platform has been heightened by the fact that many researches focus on the likely usability problems to be uncovered by conducting heuristic evaluation and by carrying out usability testing based on likely performance issues.

With Usability Engineering involving the testing of designs at various stages of development, the key challenge with many previous studies has been the question of what constitutes a usability problem. That is, what makes a usability problem real? To this question Wilson (2007) posits “a usability problem is real if it predicts a problem that users will experience in their own environment, which affects their progress toward goals and their satisfaction”. For example, observing a problem within a laboratory setting with a paper prototype of a proposed system may offer artificial results not representative of actual real-world usability problem. This according to Wilson (2007) is rather “an artifact of the paper prototype test procedure and not something that users would experience”.

Investigating the influence of design aesthetics on choice of mobile money platform tackles the problem of researchers focusing entire studies on heuristic evaluation and user testing with the objective of developing frameworks that examine the factors responsible for platform choice by also looking into context of use. Mobile payment is a recent technology that continues to record growing patronage. With its growing adoption has come the increasing report of usability problems, security lapses, confusing interface designs, indistinct navigation links among other issues.

The increasing list of usability problems has made this research more important because of the need to grow user adoption of mobile money platform as part of financial inclusion strategy of telecommunication companies and the government as a whole. With the world currently going through a health pandemic, investigating how aesthetics influences the adoption or rejection of a mobile payment platform has taken on a new meaning.

The problem setting of mobile payment systems is exacerbated by the fact that using mobile money is now becoming the norm. As previously mentioned, many studies on the subject centre on the usability of mobile payment systems while ignoring the factors that account for why users may adopt or reject one platform over another. Examining design aesthetics within the context of usability engineering in order to find out its impact on mobile money adoption has taken on more prominence in the contemporary world where electronic and digital payment has gained wide acceptance. Carrying out this research therefore helps to deliver the framework by which developers and designers can work in harmony to ensure their products will connect adequately with their target audience.

Results from a survey conducted on the influence of design aesthetics on mobile banking showed that “aesthetics have a positive effect on functional, emotional, social and epistemic value which in turn positively affect intention to adopt or reject mobile banking” (Chaouali et al 2019). That is, one’s inclination to adopt a mobile payment platform is driven by social context and emotional responses. Thus, it is important for this research to emphasize the drivers of mobile money adoption within the context of usability engineering so that current and future platforms can be developed with better understanding of what users want in a mobile payment system as against what developers project users may need.

“Perceived usefulness, perceived ease of use, lifestyle compatibility and facilitating conditions are direct predictors of user behaviours in accepting mobile wallet payments” (Alswaigh and Aloud 2021). The problem setting of mobile payment systems present this research with the opportunity to examine many unexplored areas of importance. Areas such as proximity of mobile money outlet to users, security, social influence, interactivity of the mobile platform, transaction cost, platform usability and aesthetics. Several studies venturing into the domain of electronic payments often focus on online payment systems and eCommerce. Driving this research is the ever-growing importance of mobile payment within the financial ecosystem. Its role has become more prominent during the height of the Coronavirus pandemic where people across the globe used different mobile wallets to pay for goods and services. Notwithstanding the advantages mobile money has brought, it has also been saddled with some challenges. Prominent among these challenges are the issue of fraud, identity theft, delayed payments due to network problems and system being out of service.

The problem setting of this research is therefore enhanced by the simple fact that mobile payment systems have become part of everyday life and as the goal is for such payment systems to make life easier, it makes it worthwhile to investigate any design, usability or potential functionality problem is worth examining. Thus, this research does not limit its study of aesthetics to the context of beauty or user emotive decisions based on feel and appearance, rather it expands on such elements to investigate the role they play in users choosing to adopt or reject a particular payment platform. As Folkmann (2018) points out, “a deeper understanding of aesthetics than what normally is testified to in the field of design and human computer interaction may provide knowledge regarding how design objects and human computer interaction solutions operate as interfaces in how humans approach the world”.

3.2 Research Problem

This research investigates “the influence of design aesthetics on the choice of mobile money platform in Ghana”. It explores the factors that influence why a user adopts a particular mobile money platform over another in conducting business transactions.

3.3 The Problem Setting

“Financial inclusion has been found to be fundamental to poverty reduction and to minimizing the rate of income inequality” (Moss, 2013). The Government of Ghana has for sometime enacted policies, adopted different strategies all aimed at promoting financial inclusion through its Sustainable Development Goals (SDGs) objective. However, achieving this target has been difficult as a sizeable percentage of the population still do not have access to formal financial services (Riley & Kulathunga, 2017). Aiming to improve on its unbanked percentage has led to government spearheading the drive towards a cashless economy by advocating and promoting mobile payment systems. Studies conducted by the Central Bank showed that “mobile money can become a major tool for financial inclusion” (BOG, 2008).

The quest to ensure that a considerable portion of Ghanaians adopt electronic payment systems like Mobile Money to transact business brings into focus the usability and design features aspect of it all. This is because users will immediately reject or abandon a product if it is unusable or provides a poor user experience. Due to this, usability continues to play a central role in every technological innovation that seeks wide acceptance. This research is driven by the growing adoption of mobile payment systems for financial transactions and the need to ensure that these new mobile payment platforms are without usability problems. In doing this, the role of design aesthetics is evaluated to ascertain whether it plays a role in users adopting or rejecting a particular platform. This has become more important in the contemporary world where global reports show an ever-increasing mobile money adoption across different jurisdictions.

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The problem setting of this research is therefore enhanced by the simple fact that mobile payment systems have become part of everyday life and as the goal is for such payment systems to make life easier, it makes it worthwhile to investigate any design, usability or potential functionality problem is worth examining. Thus, this research does not limit its study of aesthetics to the context of beauty or user emotive decisions based on feel and appearance, rather it expands on such elements to investigate the role they play in users choosing to adopt or reject a particular payment platform. As Folkmann (2018) points out, “a deeper understanding of aesthetics than what normally is testified to in the field of design and human computer interaction may provide knowledge regarding how design objects and human computer interaction solutions operate as interfaces in how humans approach the world”.

4. PRIOR RESEARCH EFFORTS

Mobile Money and electronic payment systems is an everchanging field that is continuously reinventing itself. Many studies that have focused on usability or mobile money as a subject area often investigate the categories of payment systems while looking at usability as a consequence of system development and not primary software or application development. Prior research effort by Layla Hasan (2009) looked at user testing as an evaluation method and the problems associated with the technique. She noted that “user testing is limited by the challenge of replicating real-world scenarios in a controlled environment”. In her presentation, user testing may not be able to find real usability problems that people come across while interacting with different platforms and applications. Her study primarily employs heuristic evaluation as a technique for uncovering usability problems and later admits that finding usability problems not listed in the heuristics makes it an inefficient method.

Scholars like Sonderegger and Sauer (2009) also investigated the effects of product aesthetics on different variables in usability tests. By using a computer simulation, participants were given two (2) identical mobile phones that were configured in line with their visual displays. Results from the experiment showed that participants rated the device with the visually appealing display higher than the one with less appealing visual display. Thus, their study demonstrated a positive correlation between visually appealing devices and their choice as being very usable although that may not be the case. Their study did not go further into how the results can be applied across multi-layered applications like mobile money platforms.

This research therefore employs a multi-disciplinary approach to investigate the influence of design aesthetic on which mobile money platform a user decides to use. Alswaigh and Aloud (2021) looked at the factors affecting the adoption of mobile money in Saudi Arabia. Prior studies have not looked at the element of design aesthetics and how it influences a user’s decision to select a particular mobile money payment platform over another. Considering the ever-important role of electronic payment in the era of a health pandemic where social distancing is being encouraged, an in-depth study like this research is needed more than ever. Thus, this study seeks to factor in the elements of layout, navigation design, colour-combination among others to ascertain their influence on the choice of which platform a user decides to engage.

5. RESEARCH GAP

Mobile payment is a technology that keeps growing. “Studies into the field have focused on the role of electronic markets, the effects of information technology on electronic commerce, interactivity, and the evolution of disintermediation to reintermediation” (Wigland, 1997). The ease with which payment is sent, saved and forwarded electronically has been the driving force behind the success of mobile money. One of the main forms of business to adopt the use of mobile payment is ecommerce. Its significance in today’s world of business cannot be overemphasized. As mentioned in the preceding paragraphs, early studies looked at usability as a consequence of software development but not as a requirement in software development.

Aesthetics has always been an area of fascination with psychologists having several theoretical and empirical work done within the research literature. Within the field of Psychology, aesthetics was discussed by Fechner whose aim was to “discover the relationship between different design dimensions and perceived attractiveness through systematic manipulations of visual stimuli” (Liu, 2003). Contemporary research into consumer ergonomics has shown that product usability may not be sole determinant of user satisfaction but that other design features may also play a role (Tractinsky et al., 2000; Norman 2004). This has resulted in a shift from a functional perspective of usability towards an experiential perspective which considers user experience (Forlizzi and Battarbee, 2004; Brave and Nass, 2008).

Current research has not demonstrated how aesthetics influences the choice of a mobile money platform over another. Prior researches are insufficient as they do not offer explanation into the correlation between design aesthetics, usability engineering, mobile payment systems and a look at ecommerce as one of the driving forces behind the surge towards mobile money. Previous studies have aimed at drawing up frameworks to be used as guidelines and benchmarks to develop software and applications. This can be verified in studies by Laylan (2009). In that study, a usability evaluation framework was developed for ecommerce applications. This involved employing real-world representative users to evaluate ecommerce applications and recording their results against predetermined principles.

Findings showed that different evaluation techniques often yield different results as confirmed by Rian et al (2003) in research on usability. In a separate study on “Design Aesthetics” by Paul Hekkert (2006), he emphasizes that product experience is “the entire set of effects that is elicited by the interaction between a user and a product, including the degree to which all our senses are gratified (aesthetic experience), the meanings we attach to the product (experience of meaning) and the feelings and emotions that are elicited (emotional experience)”. Hekkert (2006) made this assertion by distinguishing between four (4) principles: “maximum effect for minimum means, unity in variety, most advanced yet acceptable and optimal match”. The gap in his research is demonstrated by the lack of how the four (4) principles are applicable within the realm of mobile payment systems.

In establishing the research gap so as to contribute towards existing knowledge within the field of aesthetics and usability engineering, a separate study by Post et al (2016) on “Testing the aesthetic principle of unity-in-variety in product design” was examined. In the study, Post et al (2016) argue that unity-in-variety can explain aesthetic appreciation in that “in order for humans to find pleasure in their interaction with objects, they need to sense a form of unity and coherence in the various parts and approaches towards it”.

Their research examines whether there exists “a preferred balance between unity and variety while exploring how perceived visual complexity and individual differences in motivational drives may influence this combined effect of unity and variety on aesthetic appreciation” (Post et al, 2016). The gap in their research is highlighted by the fact that their study reduces aesthetics to how the sum of the parts contributes the adoption of the whole when it comes to why users accept one product over another. It generalizes through its experiments that users can be driven to engage a particular product by maximizing both unity and variety in order to achieve a balance that will offer the “greatest aesthetic appreciation” (Post et al, 2016).

Finding a gap in the research on design aesthetics and mobile payment systems led to a study by Chaouali et al (2019) on “design aesthetics as drivers of value in mobile banking”. Their study explored the determinants of value for customers by looking at the “functional, emotional, social and epistemic factors”. Their study surveyed 281 bank customers using screenshots of mobile banking applications. They conclude by asserting that “design aesthetics have a positive effect on functional, emotional, social and epistemic value and that these value dimensions positively affect intention to adopt mobile banking” (Chaouali et al, 2019). The gap in their research is explained by their focus on bank customers who may already be classified as expert users of banking applications. Furthermore, their research claims happiness moderates the effects of design aesthetics on the aforementioned value metrics. However, little is known about how functional, emotional and social values impact the choice of mobile money platforms in everyday business transactions.

Establishing a research gap within the field of usability and design aesthetics will be incomplete without examining the work of Cyr, Head and Ivanov (2006) on “Design aesthetics leading to m-loyalty in mobile commerce”. In their study, attention is given to hedonic components like enjoyment and how it impacts a user’s desire to either adopt or reject a product. “Established Technology Acceptance Model (TAM) constructs like perceived ease of use significantly impacts perceived usefulness which in turn influences adoption” (Cyr et al, 2006). Examining the previously mentioned researches reveals their complete focus on the functional, emotional and social elements of determining value and how perceived ease of use plays a significant role in impacting perceived usefulness to explain why consumers prefer one product over another. Each of the studies, introduced a new variable to ascertain how it changes choice of a product. Reviewing various literatures on the subject of usability and design aesthetics revealed a yet-to-be explored dimension of pattern, colour, weight and usability and their influence on choice of mobile money platform in Ghana. None of the aforementioned researches devoted their study to examining the underlying factors responsible in the adoption of one mobile payment platform over another. This research therefore investigates design aesthetics as a core element in software development and establishes the determinants of mobile platform choice in everyday business transaction.

5.1 Why fill the gap

“Much of academic research is concerned with abstracting from specific problems and contexts to develop generally applicable theories that help us understand situations and contexts” (Piccoli and Wagner, 2003). Having explored the gap in research in design aesthetics and mobile payment systems, the following paragraphs outline the significance of filling the gap. With the ever-increasing volume of transactions being carried out through mobile payment systems, the need has arisen to ensure its safety and usability. Ensuring its safety and usability requires further studies into the factors responsible for the choice of which platform is used by consumers.

Recent studies and literatures fall short of explaining the correlation between mobile payment systems and the influence of design aesthetics. This has become more important because a global transition to electronic payment is now driving many business interactions. A typical example is the increase in patronage of ecommerce business interactions as against traditional forms of buying and selling. E-commerce has now become a core part of everyday activity. Buying and selling online has offered a number of advantages when contrasted with traditional forms of marketing. All these benefits from eCommerce risk becoming detrimental if research gaps identified from prior studies are not addressed. Therefore, the need to fill this research gap has been necessitated by the quest to ensure that factors responsible for the choice of mobile payment systems are critically evaluated to unearth challenges and drawbacks that may hamper the growth, security and usability of such applications and softwares.

This will go a long way to add to existing knowledge in the field while ensuring that future mobile payment systems are both robust and provide good user experience.

6. RESEARCH OBJECTIVES

6.1 General Objective

Financial inclusion remains an objective of many governments aiming to increase the percentage of the banked as against the unbanked. Developing a better understanding of the financial ecosystem through the lens of mobile money will help to craft innovative products that are inclusive of those who have traditionally been left out from partaking in the financial sector. Thus, the general objective investigates “usability engineering-based analysis of mobile money platforms among bank customers in Ghana”.

6.2 Specific Objectives

This study specifically conducts a usability engineering-based analysis of mobile money platforms among bank customers in Ghana. This research will tackle the subsequent specific objectives:

1. To evaluate the influence of mobile payment charges on choice of platform
2. To assess the extent to which design aesthetics influences choice of mobile money platform for business transaction.
3. To examine the role that user profile plays in choice of mobile payment platform
4. To unearth likely usability issues and develop a framework for refining mobile payment platforms
5. To ascertain the relationship between online banking and the adoption of mobile payment platform.

6.3 Research Questions

The objectives of the research will be attained through analysis of the following questions:

1. What role does usability play in software/application development?
2. To what extent is the choice of a mobile money platform influenced by aesthetics?
3. How does user profile influence in the choice of a software or application?
4. To what extent is usability a problem on mobile payment platforms?
5. What is the relationship between online banking and the use of mobile payment platforms?

6.4 Research Hypotheses

The following hypothesis were tested for this research.

1. **H₀:** Mobile payment charges do not influence choice of mobile platform.
H₁: Mobile payment charges have significant influence on choice of mobile platform.
2. **H₀:** Design aesthetics has no effect on choice of mobile payment platform
H₂: Design aesthetics has significant effect on choice of mobile payment platform
3. **H₀:** User profile has no effect on choice of mobile payment platform
H₃: User profile has significant effect on mobile payment platform
4. **H₀:** Usability has no effect on choice of mobile payment platform
H₄: Usability has significant effect on choice of mobile payment platform
5. **H₀:** There is no effect of online banking on mobile payment platform adoption
H₅: There is a significant effect of online banking on mobile payment platform adoption

Table 1: Research Parameter Mapping

RESEARCH OBJECTIVE	RESEARCH QUESTION	RELATED QUESTION ON QUESTIONNAIRE	RESEARCH HYPOTHESES
1 To evaluate the influence of mobile payment charges on choice of platform	1. To what extent is platform choice influenced by transfer charges?	Q10 What medium do you use in carrying out your financial transactions? Q11. What influenced your answer in Question 10? Q28. Which of the following reasons is the MOST IMPORTANT factor for opting to continue with your mobile payment service?	1. H₀: Mobile payment charges do not influence choice of mobile platform. H₁: Mobile payment charges have significant influence on choice of mobile platform.
2. To assess the extent to which design aesthetics influences choice of mobile money platform for business transaction.	2.To what extent the choice of mobile payme platform influenced aesthetics?	Q11. What influenced your answer in Question 10?	2. H₀: Design aesthetics has no effect on choice of mobile payment platform H₂: Design aesthetics has significant effect on choice of mobile payment platform

<p>3. To examine the role that user profile plays in choice of mobile payment platform</p>	<p>3. How does user profile influence the choice of software application?</p>	<p>Q1. Gender: Male Female Q2. Age: 18-29, 30-39, 40-49, 50-59, Above 60years Q3. Level of Education: No Formal Education, Vocational, Basic, Secondary, Tertiary Q4. Region of Residence: Ahafo, Ashanti, Bono, Bono East, Central, Eastern, Greater Accra, Northern, North East, Oti, Savannah, Upper East, Upper West, Volta, Western, Western North Q5. Are you employed? Yes No Q6. Nature of Employment: Not Employed, Student, Entrepreneur/Self-Employed, National Service Personnel, Professional, Retired, Clergy, Prefer Not to Say, Other</p>	<p>3. H₀: User profile has no effect on choice of mobile payment platform H₃: User profile has significant effect on choice of mobile payment platform</p>
<p>4. To unearth likely usability issues and develop a framework for refining mobile payment platforms</p>	<p>4. To what extent usability a problem on mobile payment platforms</p>	<p>Q13. Do you use mobile payment for your financial transactions? Yes No. If NO skip to Question 15. Q15. Why do you NOT use mobile payment? It's Expensive, Not Secure, Poor Network, Usability Problems Q16. Do you have any issues with using mobile payment platforms? Yes No Q17. What issues do you have with using mobile payment platforms? Q19. If given the option, would you switch to a different network for your mobile payments? If NO skip</p>	<p>4. H₀: Usability has no effect on choice of mobile payment platform. H₄: Usability has significant effect on choice of mobile payment platform.</p>

		<p>Question 21 Yes No</p>	
		<p>Q20. Why would you want to switch networks?</p> <p>Affordability on other platforms, Very Secured on other networks, Ease of Use on other Networks, Attractiveness of other network's user interface Other</p> <p>Q21. Are there any improvements you would suggest to be made on the mobile payment platform you're currently on?</p> <p>Q26. How will you rate the usability of the mobile payment platform you use?</p> <p>Unusable, Difficult to use, Somewhat usable, Usable, Very usable</p> <p>Q27. Which of the following factors best describe(s) the usability of the mobile payment platform you use?</p> <p>Easy to use, Somewhat easy to use, Difficult to use, Unusable (many usability problems), Other</p> <p>Q29. Usability of a payment platform is more important to me than any other factor?</p> <p>Agree, Somewhat Agree, Strongly Agree, Disagree, Somewhat Disagree, Strongly Disagree</p>	

<p>5.To ascertain the relationship between online banking and the adoption of mobile payment platform.</p>	<p>5. What is the relationship between online banking and the use of mobile payment platforms</p>	<p>Q8 Do you have a bank account? If NO skip to Question 10 Yes No</p> <p>Q10. What medium do you use in carrying out your financial transactions? Mobile Payment, Online Banking, Cash</p> <p>Q11. What influenced your answer in Question 10? Ease of use, Affordability, Security, Convenience, Promptness, Aesthetics</p> <p>Q13. Do you use mobile payment for your financial transactions? Yes No If No skip to Question 15.</p> <p>Q15. Why do you NOT use mobile payment? It's Expensive, Not secure, Poor Network, Usability Problems, Other</p>	<p>5. H₀: There is no effect of online banking on mobile payment platform adoption.</p> <p>H₅: There is a significant effect of online banking on mobile payment platform adoption</p>
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7. SIGNIFICANCE OF STUDY

Significance of study refers to how the research being undertaken will refine, revise, or extend existing knowledge in the area under investigation. This study has unearthed how the unified theory of acceptance and use of technology can be used to explain the benefit of user inclusion during software design and how this can go a long way to promote financial inclusion through the use of Mobile Money platforms (MoMo).

7.1 Practical

The practical significance of this study is that results of this research will enable software developers, usability evaluators in the field of technology adopt new strategy of user involvement in the elementary stages of software development to alleviate errors and minimize cost. The outcome of this study will contribute to existing knowledge by serving as the platform on which further studies and new frameworks for interaction design will be built. As previously mentioned, this research shows that putting designers in close proximity to users means an in-depth understanding between designers and users which is necessary in building a product that respects privacy and the quality of life.

7.2 Theoretical

The findings of this study will add to the literature on mobile payment systems and the factors driving adoption. It will enrich the debate on the predictive framework to be used in determining the role of design aesthetics in choice of mobile money platform. It will also add up to the collective pool of knowledge on how functional, emotional, social and epistemic value determines platform adoption.

Furthermore, the study will apply the theories of prominence interpretation, the technology acceptance model and the economic theory to explain why a user may choose one mobile payment platform over another. These theories will be combined to analyze the reasoning behind inexplicable decisions of users when it comes to conducting mobile payment. Lastly, the fusion of quantitative and qualitative variables to ascertain the role of design aesthetics in mobile payment will contribute to the methodological approaches of predicting choice of mobile money platform.

7.3 Policy

In terms of policy significance of this study, it is imperative to note that the choice of any mobile money platform is first and foremost dependent on the availability of mobile networks. Limited or no network coverage emerged as a major obstacle to mobile money adoption in the study. There are still many rural communities in Ghana with limited, unstable or no network coverage. For adoption rates to continue rising, the telecommunication companies in Ghana should expand their telecom infrastructure, especially to cover the rural areas where the network coverage is poor, and areas that also face limited access to financial services. This should be facilitated by the National Communication Authority, which is the main regulatory body mandated under the law to regulate the operations of the telecommunication companies in Ghana. Service providers should consider making mobile money services more affordable to the large proportion of Ghanaians who still consider the service expensive.

One of the factors reducing the probability of adoption among those with low education is the cost of transactions. To enhance financial inclusion, the Bank of Ghana should, as a matter of urgency, reduce the high tariffs on mobile money transactions. The 2% service charges on mobile transactions make the service costly to users compared to the monthly bank charges. This means that the poor and unbanked are accessing financial services through mobile payment at a relatively high cost compared to those who are financially included. Reduction of the 2% tariff would therefore make the service more affordable to those who do not use any formal financial service.

8. LIMITATIONS OF THE STUDY

This section documents the limitations of the approaches, procedures, methods to be adopted to achieve the expected results of the research work. This section also highlights factors beyond the control of the study. One of the main limitations of this study was the decline by AirtelTigo to participate in the study. Although their participation would have given a comprehensive data from the perspective of a service provider. It is important to state that their exclusion did not in any way undermine the quality of responses from the two other service providers. Secondly, the study was limited by the unwillingness of some respondents to answer certain questions truthfully and honestly. One contributory factor to this was the rise in mobile money fraud which made some respondents apprehensive and selective in their answers. Requiring participants to disclose information about mobile money accounts elicited strong reactions.

Finally, this research was limited by timelines and schedules for delivery or the report on findings. The study was conducted within a timeframe thereby limiting the sample size that could have been used to give a fair reflection of the general population.

9. CONCLUSION

“Ghana currently has 19 million active mobile money accounts driving the country’s digital financial services sector” (Addison, 2021). Results from this study will inform future design decisions of mobile money platforms as the technology continues to evolve. A generally held view is that mobile money transfer charges is the deciding factor on the choice of which platform or application a user chooses. This study assesses how mobile money payment system has permeated sectors of the Ghanaian economy previously untouched by the banking industry. This permeation is driving economic growth in areas that have not seen development in a while. With the government seeking to drive growth through a cashless economy, the role of mobile money as a payment system has become more pressing. It makes this study important because results derived through the data gathered will help to ascertain the driving force behind the choice of a particular platform over another.

Prior researches have not delved into the influence of design aesthetics within the realm of mobile money. Previously cited report by Magnetic North in 2016 show how important having a working usable application is to revenue retention for any business. This research is far-reaching in the way it analyses how individuals use mobile money applications to replace traditional face-to-face business interaction. “Academic research has a relatively long horizon which involves extrapolating from specific instances to make far-reaching statements about the nature of human and economic activities, the structures we create, and the socio-technical infrastructures that we employ to enable information systems” (Piccoli and Wagner, 2003).

This research looks at the development, implementation and use of mobile money applications by examining the influence of design aesthetics on the choice of mobile money platform and attempts to uncover relationships that transcend the characteristics of a particular platform or application. It seeks to provide guidance for the management and use of existing and future payment technologies. A contribution of this nature is all the more important in a field like mobile payments given the growth of online businesses and the growing need of both customers and business to transact business remotely. This research provides a foundation and increases the long-term understanding of the role and effects of poorly designed mobile payment systems. This research is therefore necessary because it provides a framework on which interactive mobile money applications and technologies can be evaluated. Through this, design features which contribute to the success of specific mobile money platforms will be analyzed and serve as a backdrop on which future payment platforms will be modelled.

“Rapid changes in payment technology have made the use of technology in financial services to become a necessity rather than a choice driven by consumer demand for convenience, efficiency and lower cost of transactions” (Addison, 2021). This research aims at contributing to the existing body of knowledge on mobile payment systems and how it can be used to enhance the drive towards better financial participation in Ghana.

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