



ASHESI UNIVERSITY

ASSESSMENT OF USABILITY ISSUES IN DIGITAL FINANCIAL PRODUCTS IN GHANA

THESIS

B.Sc. Management Information Systems

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ASHESI UNIVERSITY

**ASSESSMENT OF USABILITY ISSUES IN DIGITAL FINANCIAL
PRODUCTS IN GHANA**

UNDERGRADUATE THESIS

Undergraduate Thesis submitted to the Department of Computer Science,
Ashesi University in partial fulfillment of the requirements for the award of
Bachelor of Science degree in Management Information Systems.

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Declaration

We hereby declare that this thesis is the result of our own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate Signatures:

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Date:

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I hereby declare that the preparation and presentation of this thesis were supervised in accordance with the guidelines on supervision of thesis projects laid down by Ashesi University.

Supervisor's Signature:

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Abstract

The proliferation of digital financial products, such as mobile money, has brought new opportunities for billions of people in developing countries to access financial services. Digital financial products are playing a crucial role in bridging the financial inclusion gap that exists between developed and developing countries. In Ghana, financial exclusion is more common among women and people living in rural areas. However, digital financial products on mobile phones (i.e., mobile banking and mobile money) and other platforms, such as automated teller machines (ATMs) and internet banking are accelerating financial inclusion in Ghana. Yet, there are challenges that users face when using digital financial products. In this thesis, we assess the usability issues in digital financial products. Our focus is on mobile money and popular mobile banking applications used by Ghanaians. The study provides user-centered design recommendations that interface designers, financial service providers, and other entrepreneurs can use to design apps that suit user needs and offer improved usability.

Chapter 1: Introduction

At least 2 billion people living in developing economies are estimated to lack access to financial products and services, including savings and credit [19]. The World Bank estimates that over 1.7 billion adults, mostly living in emerging economies, did not have access to a bank account in 2017. Yet almost every adult living in developed economies had an account with a mobile financial service provider or an official banking institution in 2017 [8]. Globally, financial exclusion is more widespread among women and the poor; more than half of unbanked adults come from the poorest 40 percent of families in their countries [8].

The proliferation of mobile money and other digital financial products in emerging economies, especially in Sub-Saharan Africa, offers an opportunity to provide access to financial services to those who would have otherwise remained financially excluded. Digital finance, which involves using technology, including mobile money and internet banking, to deliver financial products and services, can play a crucial role in accelerating coordinated efforts towards poverty reduction and achieving economic growth in developing countries [19, 33]. In the context of this study, financial inclusion means the existence of effective digital finance products at an affordable cost to both users and providers of these services and the users can easily access them to meet their needs.

1.1 Background

Digital financial technologies are increasingly enabling those who have traditionally been financially excluded to invest, access credit, transfer money, or purchase insurance in new ways. McKinsey Global Institute [2016] reports that digital finance can grow the value of all

emerging economies to over \$3.7 trillion by 2025 and enable at least 1.6 billion people to have access to financial services [19]. Digital financial services are crucial in achieving sustainable development goals (SDGs). For example, digital financial products can accelerate efforts toward reaching SDG ten, which focuses on “reducing inequalities within and among countries” [37]. Digital finance products accelerate the goals for financial inclusion by providing affordable, secure, and convenient financial services to poor individuals in the developing world as customers move from cash-based transactions to formal digital financial transactions on secured digital platforms [29]. Digital financial services can also amplify efforts to achieve greater social and economic equality by creating opportunities to include and empower women. For example, this can be achieved by using services such as mobile banking accounts and digital payment systems which allow them to make their own decisions about saving, spending, and taking financial risks [29, 33].

1.2 The Problem

Despite the vital role that digital financial products and services can play towards achieving financial inclusion and alleviating poverty, many challenges remain that continue to exclude some people from accessing digital technology and accessing financial products and services. Some of the challenges users face include poor network coverage, higher transaction costs, susceptibility to scams, and the lack of interoperability. Users also encounter usability challenges, such as complicated onboarding procedures and requests for more input, which may discourage new users from adopting digital financial products [3, 20, 29].

1.3 Research Questions

The issues described above inspired this research study to answer two related questions. First, how do Ghanaians living in peri-urban communities use digital financial products? Peri-urban communities lie on the outskirts of cities and are usually the areas of transition from urban to rural settings. Among other characteristics, people living in these areas tend to be low-income earners and are moderately educated [20]. Also, residents of peri-urban areas often have less access to newer technologies than their counterparts in urban areas [20]. This makes their use contexts unique. A second question we intend to answer in this research is what are the usability barriers Ghanaians living in two areas (urban and peri-urban) face with existing digital financial services? What are the differences, if any, in the usability challenges that users face in the two areas?

Focusing on participants aged between 18 and 35, we situated our research in two areas in Ghana, Berekuso and Madina Market. Berekuso is a peri-urban area in Eastern Ghana, and Madina is an urban market area in Greater Accra, Ghana. We provide justifications for the situation of the study and the sample in Chapter 3.

1.4 Research Objectives

Digital financial products, such as mobile money and mobile banking apps, call for unique design considerations depending on the contexts of their use. As such, the main objective of this research is to come up with a set of user-centered design principles that designers, developers, and financial technology companies can follow when designing digital financial products for users living in urban and peri-urban communities in Ghana, which may also be of interest to designers working in similar Sub-Saharan African communities. We also put our

research findings to use in a prototype interface design that is suitable for the use contexts of the participants in this study.

1.5 Relevance of Research

Research has been done in the field of Human-Computer Interaction (HCI) to analyze the usability issues that people face when using digital financial products. However, a review of literature revealed that less research has been done on the usability issues affecting specific groups of users. Consequently, such studies [3, 20, 21, 36] assessed usability challenges in the abstract, and not in sample populations selected according to specific characteristics of the participants, overlooking the nuanced use contexts for digital financial products. This study, therefore, contributes to existing HCI literature by focusing on the specific usability challenges users from two areas in Ghana face when using digital financial products, particularly mobile money and mobile banking applications.

1.6 Outline of the Thesis

The thesis has been organized into five chapters. This chapter introduces the research topic, describes the problem being explored, and states the research objectives. The second chapter provides a review of relevant literature and analyzes previous usability studies for digital financial products, specifically mobile money transfer applications. Chapter two also identifies gaps in Human-Computer Interaction literature this study intends to fill. The third chapter describes the research methods, sampling techniques, data collection, and analysis techniques used in the study. Chapter four discusses the results of the study, and chapter five provides the conclusions and recommendations from the research.

Chapter 2: Literature Review

2.1 Overview

Several scholars have conducted research to assess the usability of various financial applications, including emerging financial technology products, sometimes referred to as fintech. We begin this section by discussing the prevailing socio-economic context of Ghana. In the review below, we focus on literature from Human-Computer Interaction (HCI) to understand the broad categories of the usability issues in digital financial products that may be relevant to users in the urban and peri-urban contexts in Ghana, West Africa. The review emphasizes literature that discusses usability issues encountered by users in developing economies. We then narrow our review by looking at HCI papers specific to Ghana.

2.2 The Socio-Economic Context of Ghana

Ghana is a lower-middle-income country with a population of 29.6 million people. Ghana's economy grew at an annual average of 7 percent between 2017 and 2019, but this growth has significantly declined due to the COVID-19 pandemic. As a result, poverty levels have risen from 25 percent in 2019 to 25.5 percent in 2020 [35]. Nevertheless, the World Bank projects the economy will grow at a rate of 5.1 percent between 2021 and 2023 [35].

Over the years, Ghana has made positive strides towards achieving financial inclusion, with more Ghanaians gaining access to financial services. In 2015, 58 percent of Ghanaians had access to formal banking services, increasing from 41 percent in 2010 [10]. Mobile money alone contributed about 7 percent of the 58 percent, while banks contributed 36 percent [10]. The World Bank's recent Financial Inclusion Index (Findex) database from 2017 shows that 58 percent of Ghanaians have a financial account, with mobile money accounting for 39 percent

of the accounts [10]. Additionally, a 2015 study revealed that almost one-third of adult Ghanaians use informal financial services, including Village Savings and Loan Associations (VSLAs) [10].

While Ghana has made progress, financial inclusion varies widely across regions and demographics in the country, with women, the poor, and those living in rural areas being the most financially excluded [10]. Geiger et al. [2019] discuss that long distances to banks and non-bank institutions, such as savings and loans companies and insurance firms, prevent people living in remote areas from accessing financial services. Other significant barriers to financial inclusion in Ghana are financial illiteracy and higher interest rates [36].

2.2 Previous Usability Studies

A number of usability studies have been conducted in urban slum areas in developing countries in order to understand interface design issues for illiterate and semi-literate users. For example, we examined usability studies conducted by Medhi et al. [2009] in urban slum areas in Kenya, India, South Africa, and the Philippines to understand the ideal interface design for illiterate and semi-literate users. Using a sample size of 90 participants, Medhi et al. [2009] used ethnographic methods to assess the usability of various mobile payment applications, including M-Pesa in Kenya and Wizzit in South Africa. Focusing on evaluating user interaction in text-based, voice-based, and rich multimedia-based mobile payment interfaces designed for illiterate and semi-literate users, Medhi et al. [2009] found that users in urban slum communities preferred less complex interfaces, especially those that used less text. Rich multimedia interfaces are interfaces that use various forms of media (images, videos, and sound) to provide users with a more interactive experience when using technology [32]. Medhi et al. [2009] also

observed that rich multimedia interfaces are more usable, as observed in the second phase of the usability studies that they conducted involving 58 participants in the countries of study.

Other usability issues that Medhi et al. [2009] highlight in digital payment applications are unclear hierarchical navigation and hidden functions or features. Hidden functions, which emerge from poor interaction design, are difficult to discover because users have to go through unrelated interfaces to complete tasks [20]. Consequently, the process of discovering hidden functions in an interface can be confusing even for literate users who are more comfortable with text-based interfaces [20]. The usage of English, complex banking concepts, and multiple authentication points were also identified to negatively affect usability in payment applications because tasks take longer to complete [20]. Medhi et al. [2009] observed that the dominant use of English in transaction receipts was a challenge among semi-literate users. Specifically, users that were less fluent in English struggled to read the text in the transaction receipts sent over text messages.

Balan et al. [2000] conducted user studies involving 104 undergraduate university students in Singapore and at the University of Washington in the United States. The usability studies were based on a payment application called mFerio that was designed to replace cash-based transactions. According to Balan et al. [2000], a payment system is usable if it is easy to use, easy to learn, and fast to use. mFerio's usability studies revealed that multiple authentication points negatively affect usability in payment applications because users take longer to finish tasks [3]. As such, designers of mobile payment applications have to balance the trade-off between security and usability in mobile payment applications. The usability studies for mFerio demonstrated that users were comfortable using multi-factor authentication that implemented biometric authentication and other authentication techniques, including

graphical passwords that replace the use of alphanumeric characters with images to authenticate users [3].

Another usability study was conducted in South Africa by Mujinga et al. [2018] to evaluate usability issues in online banking systems used by most banks in South Africa. The study used statistical analysis techniques that included t-tests, ANOVA, and correlation to investigate whether there are statistically significant differences in system usability scale (SUS) scores based on a variety of moderating factors in South Africa. Using a sample of 540 respondents, the authors did an overall assessment of online banking based on different demographic factors. According to Mujinga et al. [2018], system usability has three main aspects, which are specific users, specified goals, and specified contexts of use [21]. As such, developers need to incorporate all three aspects of usability in order to build systems that are efficient and are able to satisfy user needs. The study revealed that young people rated online banking systems poorly because they are used to social media applications, which have better usability and user experience [21]. Mujinga et al. [2018] found out that older people and higher-income earners used online banking frequently compared to young people [35]. Most importantly, the study highlights the importance of considering diverse groups of users when developing digital products.

Olaleye et al. [2017] conducted a study to investigate the user experience of mobile money in Nigeria. Conducted among 80 males and 70 female participants who are frequent mobile money users in Nigeria, the study utilized offline surveys that used a seven-point Likert scale. The Likert scale ranged from 1 “strongly disagree” to 7 “strongly agree to measure security, convenience, system anxiety, and user experience. The study revealed that security is

one of the important issues that influence the user experience for mobile money applications because users are comfortable and confident on secure platforms [28].

Most relevant to our study is the research that Yu and Ibtasam [2018] conducted to investigate mobile money usage in Ghana to understand the financial needs of Ghanaians and assess the role that mobile money plays in satisfying those needs. Using in-depth and semi-structured interviews, ad-hoc discussions, and observations with 25 individuals, Yu and Ibtasam [2018] conducted ethnographic studies in five cities and their surrounding towns. Primarily, the study focused on Unstructured Supplementary Service Data (USSD), which is a communication service that uses shortcodes to establish a connection between devices, usually a mobile phone and a server. USSD services are available on both feature phones and smartphones. Apart from USSD, the study also identified issues with smartphone-based and over-the-counter applications. In their research, Yu and Ibtasam [2018] found that the usage of paper manuals or posters to guide users or display transaction fees at mobile money agent shops increases the cognitive load of users and eventually leads to confusion [36]. Medhi et al. [2009] made similar observations in Kenya, India, South Africa, and the Philippines [20].

2.3 Gaps Identified from Literature

To summarize, we focused on literature in HCI to understand the current issues that people face as they use fintech products. The literature revealed that text-heavy interfaces pose significant usability barriers to illiterate and semi-literate users because they increase users' cognitive load. We also learned that the use of complex banking concepts in digital financial apps can confuse users from urban and urban slum communities. Literature also informed us that both literate and semi-literate users face navigation challenges in interfaces that have

unclear hierarchical menus and hidden functions. Longer onboarding due to complex user authentication can also be addressed to resolve some of the usability issues discussed above. The usage of English in transaction receipts was also identified as a challenge, especially among less fluent users.

From our review of literature, we realized some studies did not take into consideration the nuances of mobile money usage in different contexts. Specifically, these studies focused on urban and urban slum areas, and most of them did not break down their samples by age group. Only one paper [36] covered a handful of usability issues that are specific to users of digital financial products in urban Ghana. Since none of the studies we analyzed discussed usability issues faced by users in peri-urban areas, the studies assessed usability issues in digital financial products in the abstract. Nevertheless, we argue that it is possible the challenges and barriers addressed in the literature may be the same in the two areas of Ghana.

Our study in Berekuso and Madina fills in the research gap identified above by focusing on the usability barriers that young people (aged 18 - 35) living in two areas of Ghana face as they use digital financial products on their mobile phones. As described in the next chapter, the two areas were chosen because individuals living in both areas are mostly from a lower socio-economic background and have a modest level of education. But there are also key differences with regard to newer types of mobile phones in the two areas.

Chapter 3: Methodology

3.1 Overview

The primary objective of this research is to understand the usability challenges users face with digital financial products, especially mobile money and mobile banking apps, in the context of two areas in Ghana (an urban market area and a peri-urban area). The study seeks to answer two related research questions: (1) How do Ghanaians living in peri-urban communities use digital financial products? (2) What are the usability barriers Ghanaians living in two areas (urban and peri-urban) face with existing digital financial services? What are the differences, if any, in the usability challenges that users face in the two areas? This chapter describes the research design, the choice of the research sites and the sample population, data collection methods, and data analysis techniques used to answer the research questions. The chapter also justifies the chosen methods used to collect and analyze data.

3.2 Research Design and Data Collection Tools

There are several research methods common in Human-Computer Interaction studies. Qualitative research methods are most common because the goal of HCI research is to understand the experience and understandings of the users of technology [4, 6]. Similarly, this study sought to understand the experience and understandings of Ghanaians when using digital financial products. Qualitative methods were ideal for the study because they allow HCI researchers to collect data on user behavior and attitudes while asking questions that can inform the design of technology to meet contextual user needs [4, 31]. Qualitative techniques also enable researchers to draw insights directly from field observations. This may not be possible with quantitative methods, which are usually based on mathematical analyses and provide indirect data on user behavior and attitudes [31].

3.2.1 Contextual Inquiry

A contextual inquiry is a field research technique in Human-Computer Interaction that involves observing how people use technology in their natural environment while asking them open-ended questions to understand the reasoning and motivation behind their behavior when interacting with a product [9, 13]. Holtzblatt et al. [2005] explain that a contextual inquiry is ideal for studies that assess usability problems in products to generate recommendations for usability improvements. Being a field study technique, a contextual inquiry provides more validity to research findings [6, 31]. Due to the nature of this study, a contextual inquiry was appropriate for gathering data on the usability issues that Ghanaians living in two areas encounter when using fintech apps.

3.2.2 Semi-structured Interviews

In qualitative research, semi-structured interviews involve researchers asking open-ended questions that were already prepared in order to discover participant perceptions on the topic of interest [11]. Interviews are an effective tool for conducting HCI research studies as they reveal insights into user behavior, preferences, and impressions while enabling researchers to identify usability issues that would not have been captured during a contextual inquiry [9, 18]. Interviews also help HCI researchers understand people's needs, challenges, and perceptions about new technologies [4, 18]. The interview data we collected allowed us to gain background information from users, and it supplements the contextual inquiry data, enabling us to gain useful insights from participants on their user experience with digital financial products. The interviews also helped establish the common use cases of mobile money and banking apps in the areas where the research took place.

3.2.3 Other Methods Considered

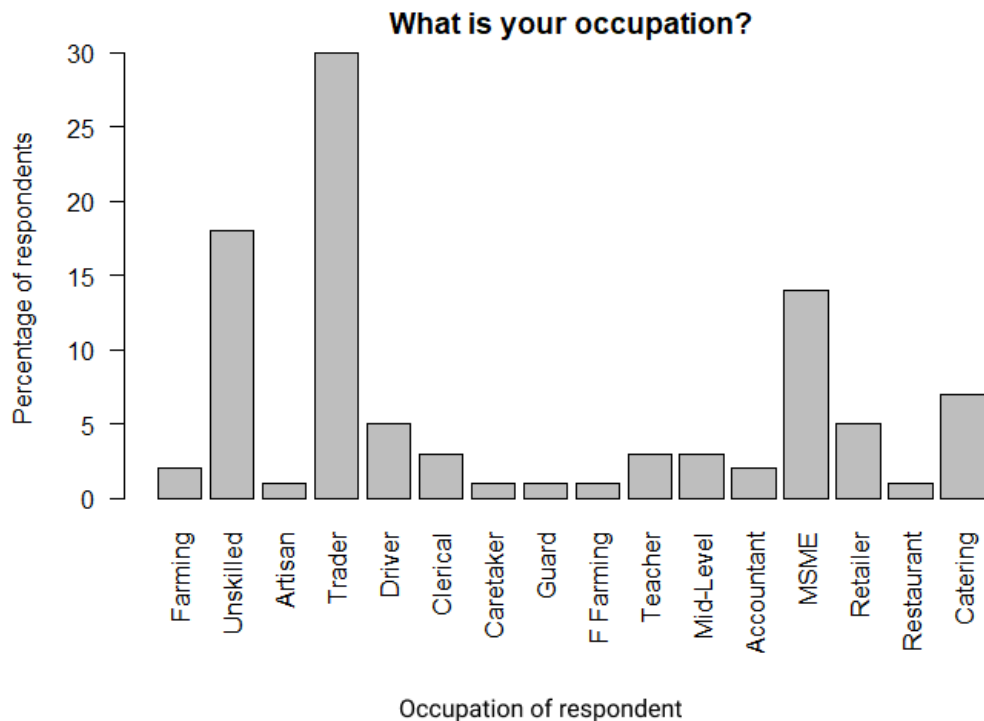
We considered other data collection methods in HCI that were not used in the study. These methods include focus group discussions and Think-Aloud, which involves users describing their thoughts while using a product [6]. Focus group discussions were not used because they provide less depth compared to contextual inquiries and interviews [6]. Similarly, we did not use the Think-Aloud technique because it can prompt users to filter their thoughts instead of saying what is on their minds in real-time during studies [24].

3.3 Profiles of Research Sites

Situated in Berekuso and Madina Market, the study is interested in participants aged between 18 and 35 who use mobile phones and digital financial products, particularly mobile money and mobile banking apps. Madina is a suburb located in the Greater Accra region of Ghana. Langevang and Gough [2009] describe Madina as an urban area with a youthful population that is involved in both formal and informal employment [16]. Madina has a diverse population of youths that participate in entrepreneurship and have received some formal education. Madina Market presents an opportunity to study the contexts of the use of mobile money and mobile banking apps among the customers and owners of small and medium enterprises (SMEs) in urban Ghana.

On the other hand, Berekuso is a peri-urban area in the Eastern Region of Ghana. Berekuso is an ideal community to understand how people living in peri-urban communities use technologies like mobile money for several reasons. Being a predominantly low-income area, the socio-economic context of the area is relevant in answering our research questions. Similar to Madina, Berekuso is a youthful community having a majority (52.82%) of the

inhabitants aged between 18 and 35 involved in skilled, unskilled, or semi-skilled employment (see Figure 3.1 below).



¹Figure 3.1: A bar plot showing occupations of Berekuso residents aged 18-35. n=143

Secondary data collected from the Berekuso Household Survey that was conducted in 2020 shows the use of mobile phones for financial transactions through mobile money and mobile banking apps. Out of the 248 subjects that were interviewed in the survey, 143 participants were youths aged between 18 and 35, and 130 subjects were adults aged 36 years or older. Data on the 143 youths shows that 92.2% owned mobile phones, including smartphones, feature phones, or both. Out of all the young adults that own phones, exactly 50%

¹ Fish Farming has been shortened to “F Farming”, and “Mid-Level” stands for Mid-Level Professional

own smartphones compared to 29.6% of their counterparts owned feature phones (see Figure 3.2).

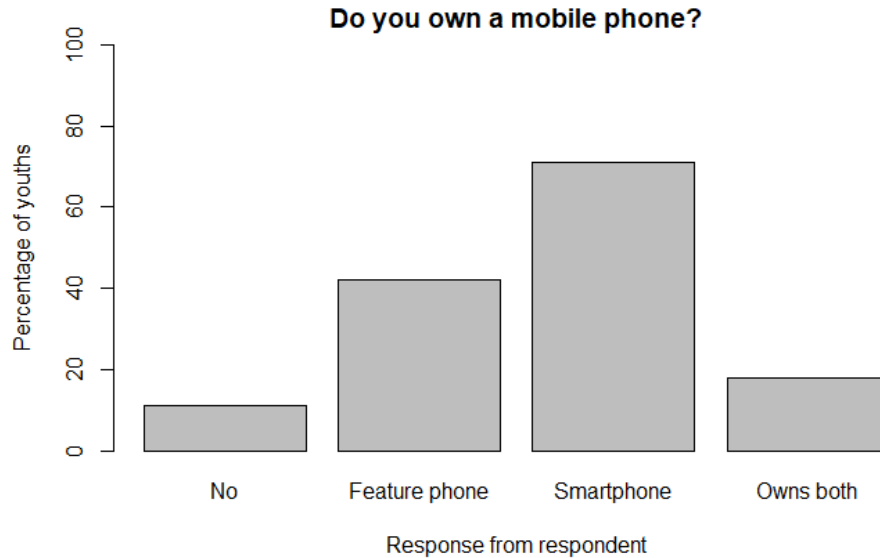


Figure 3.2: A barplot showing mobile phone ownership among youths aged 18-35. n=143

Additionally, data from the household survey also shows that younger participants aged between 18 and 35 years use mobile money more frequently on their smartphones compared to adults. As shown in Figure 3.3 and Table 3.1, 48% of youths who own smartphones reported using mobile money more often on their smartphones. In contrast, only 28% of adults aged 36 years or older reported using mobile money more frequently on their smartphones as seen in Table 3.2.

Table 3.1: A proportional table showing the frequency of mobile money use by young mobile phone owners in Berekuso

Frequency of mobile money use	Do you own a mobile phone? Which type?			
	Have no phone	Own feature phone	Own smartphone	Own both
Use mobile money less frequently	0.14	0.25	0.51	0.09
Use mobile money more frequently	0.00	0.34	0.48	0.16

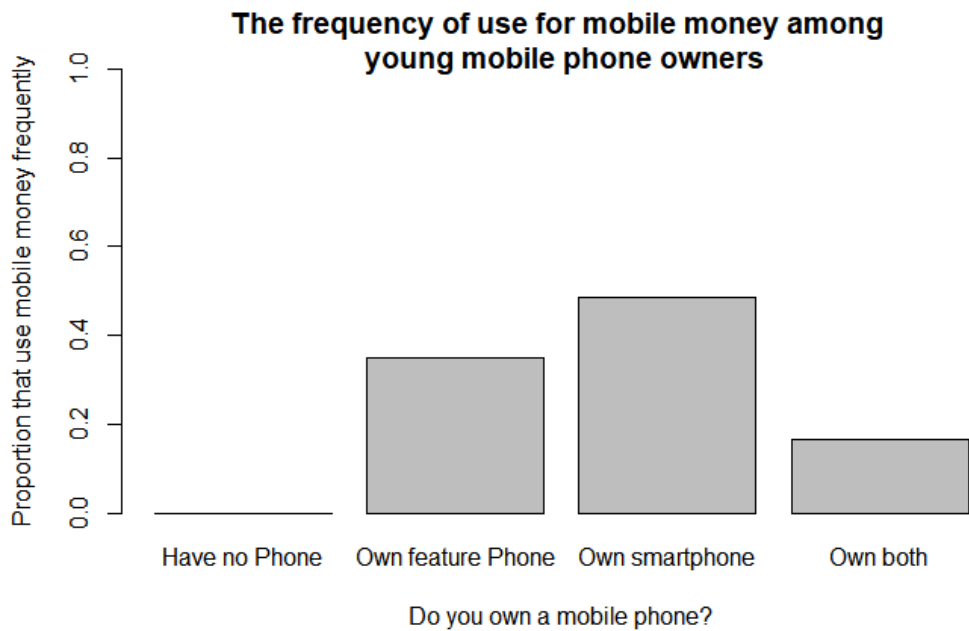


Figure 3.3: A bar plot showing the proportion of youths aged 18-35 that own mobile phones and use mobile money frequently. n=143

Table 3.2: A proportional table showing the frequency of mobile money use by adult mobile phone owners in Berekuso

Frequency of mobile money use	Do you own a mobile phone? Which type			
	Have no phone	Own feature phone	Own smartphone	Own both
Use mobile money less frequently	0.18	0.51	0.23	0.06
Use mobile money more frequently	0.00	0.65	0.28	0.06

We focus on participants aged between 18 and 35 in our study because of the key differences in mobile phone ownership and the use of mobile money described above. Furthermore, a handful of previous studies discuss that young adults are more conversant with recent technologies than older adults [27, 33]. For example, O’Brien et al. [2012] acknowledged that older users are more likely to be well-acquainted with interaction styles in technologies that emerged while they were younger [27]. Unlike younger users, older adults use more cognitive effort and find it challenging to navigate modern interfaces, such as menus [27]. Similarly, Jelfs et al. [2013] found that there is a greater likelihood for younger people to have more access to technology compared to adults [15].

3.4 Sampling Technique

The study used purposive sampling to select participants for both the contextual inquiry and the semi-structured interviews. Purposive sampling is a non-probability sampling technique

that does not involve selecting participants at random [1]. Unlike probability sampling methods, where subjects are selected at random, purposive sampling requires researchers to deliberately choose participants with specific characteristics deemed relevant to answering research questions [1]. Creswell [1998] and Allen [2017] discuss that purposive sampling is ideal for studies aimed at understanding the perspectives of participants from specific contexts rather than general populations [1, 7]. Since this study investigates the usability challenges in fintech products that mobile phone users aged between 18 and 35 face in urban and peri-urban areas, purposive sampling was appropriate. Specifically, the study used heterogeneous sampling, a type of purposive sampling in which researchers select participants with diverse perspectives [7]. Heterogeneous sampling was appropriate because it enables researchers to gain more insights on a research topic from participants. Considering the resource constraints of the study, heterogeneous purposive sampling was also the most cost-effective.

3.5 Sample Size and Description of Participants

The peri-urban sample for the semi-structured interviews and the contextual inquiry was drawn from residents of Berekuso, and it included security guards, grocery shop owners, a mobile money agent, and other small-scale business owners. In Berekuso, the interviews had a total of 20 participants, and the contextual inquiry had 10 participants. At Madina Market, we recruited 10 participants for the contextual inquiry. Empirical evidence in HCI shows that studies with a single participant reveal one-third of usability issues users face [9]. For example, Nielsen and Launder [1993] found that HCI researchers discover fewer issues if evaluations are done with samples with more than five participants [26]. However, Holtzblatt et. al [2005] recommend having a sample of at least ten participants, so that researchers learn more about

the extent of the usability challenges that users face [9, 13]. For these reasons, this study focused on the smaller samples described in this subsection.

The participants of the study at the market included small-scale business owners, agro-input dealers, mobile phone technicians, mobile phone sellers, and an employee at a local bank. All participants from this study owned mobile phones and had completed some formal education. Most of the subjects used smartphones and some owned both feature phones and smartphones. Among the 20 participants that participated in the semi-structured interviews in Berekuso, 12 owned smartphones, 7 owned feature phones, and 1 owned both types of phones (see Figure 3.4 for the counts and Table 3.3 for the percentages).

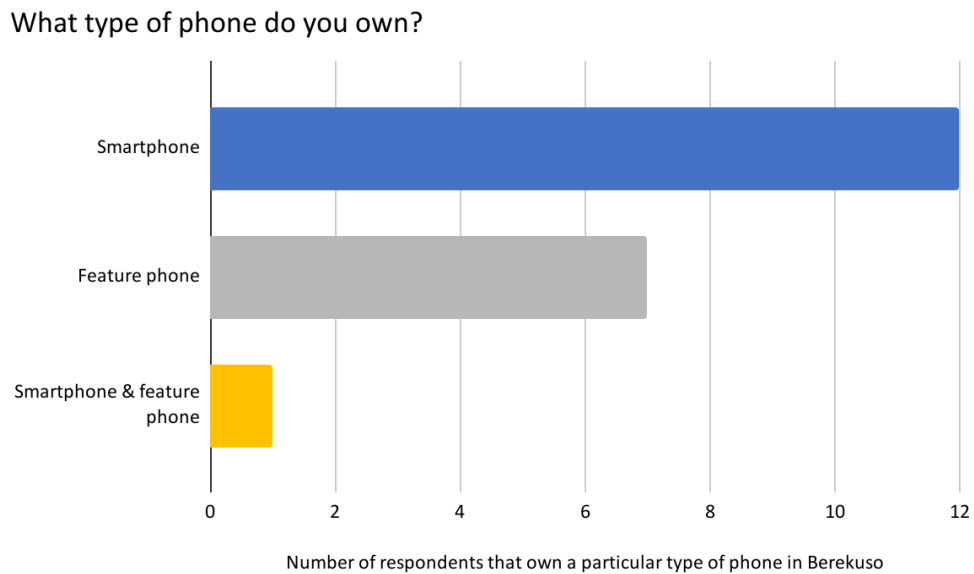


Figure 3.4: A bar plot showing the types of mobile phones participants owned in Berekuso

Table 3.4: Percentages of participants that own a particular mobile phone type in Berekuso

<i>What type of phone do you own?</i>	<i>Percentage of participants</i>
Feature phone	35.00%
Smartphone	60.00%
Smartphone & feature phone	5.00%
Grand Total	100.00%

A majority of the participants in Berekuso (16 or 80%) used MTN Mobile Money. 2 participants used AirtelTigo Cash, 1 participant used both MTN Mobile Money and AirtelTigo Cash, and 1 participant used MTN Mobile Money and Vodafone (see Figure 3.5 for the counts and Table 3.5 for the percentages).

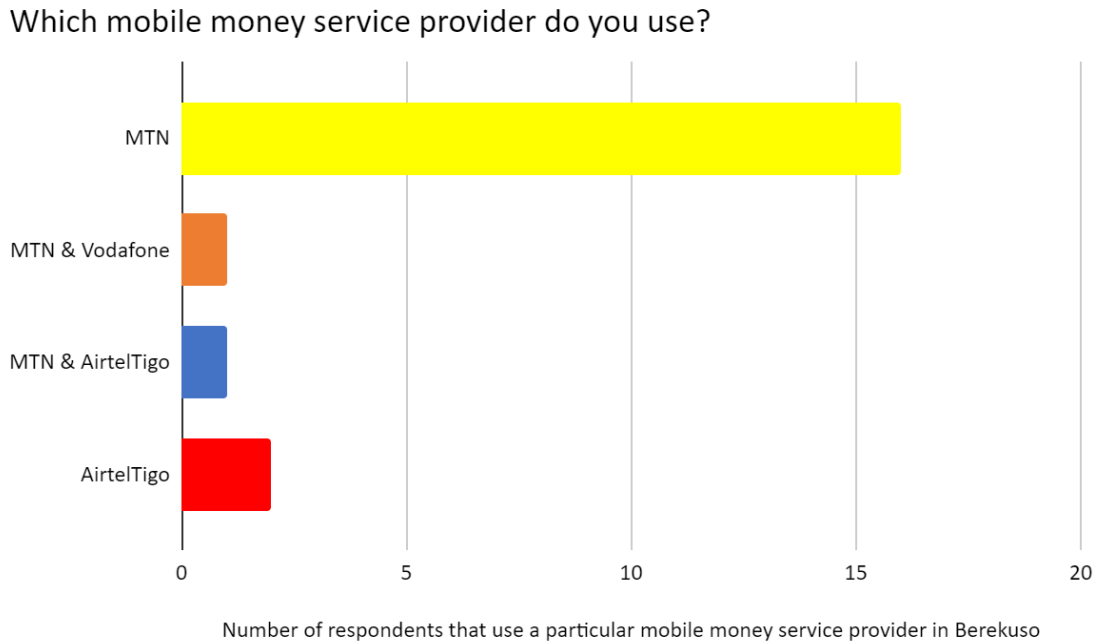


Figure 3.5: A bar plot showing mobile money service providers participants in Berekuso use

Table 3.5: Percentages of participants in Berekuso that use a particular mobile money provider

Which mobile money service provider do you use?	Percentage of participants
AirtelTigo	10.00%
MTN	80.00%
MTN & AirtelTigo	5.00%
MTN & Vodafone	5.00%
Grand Total	100.00%

Additionally, 11 out of 20 participants (55%) of the semi-structured interviews conducted in Berekuso do financial transactions on their phones everyday (see Figure 3.6 for the counts and Table 3.6 for the percentages).

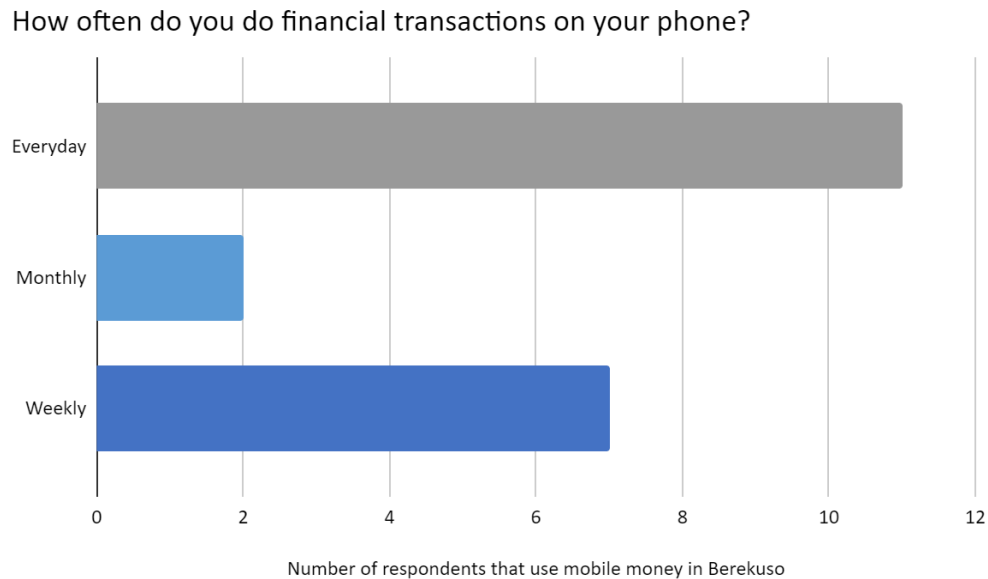


Figure 3.6: A barplot showing how often participants in Berekuso do transactions on phones

Table 3.6: Percentages of participants in Berekuso and how often they transact on their phones

<i>How often do you do financial transactions on your phone?</i>	Percentage of participants
Everyday	55.00%
Monthly	10.00%
Weekly	35.00%
Grand Total	100.00%

As shown in Table 3.7, 16 out of 20 participants (80%) of the semi-structured interviews in Berekuso had formal banking accounts; the subjects bank with Ecobank, GT Bank, and Fidelity Bank.

Table 3.7: Percentages of participants in Berekuso that own bank accounts

<i>Do you have a bank account?</i>	Percentage of participants with accounts
No	20.00%
Yes	80.00%
Grand Total	100.00%

3.6 Data Collection

We used questionnaires with open-ended questions to collect data from participants of the semi-structured interviews in Berekuso. On the other hand, three digital financial applications were used to collect data for the contextual inquiries in Berekuso and Madina — MTN’s Mobile Money USSD App, Ecobank’s Android App, and MTN’s Mobile Money Android App. There are other apps on the Ghanaian fintech market, but the three apps from MTN and Ecobank were chosen because a pilot of this study revealed our research participants were familiar with these apps.

During the contextual inquiry, we presented users with a scenario that required them to check their balance and send an amount of 2 Ghanaian Cedis to a mobile money account. After presenting the scenario, we observed the participants complete the two transactions (tasks) using the app that was most familiar to them. Due to the sensitivity of the topic and user concerns towards fraud, it was more convenient for users to perform both tasks on the devices and accounts we provided during the study. We had an Android device (the Samsung Galaxy S9), a feature phone, and two iOS devices (iPhone X and iPhone 8Plus). Throughout the interview and the contextual inquiry, we gathered notes and wrote memos to document insights from the field observations. The notes were then transferred to a Google Sheet and a Google Document to prepare the data for analysis.

3.7 Data Analysis

The study used thematic analysis to analyze the qualitative data that we collected. When conducting a thematic analysis, researchers identify patterns or recurring themes that emerge in the qualitative data using a classification or descriptive approach [7]. Using the classification technique, we generated themes and matched them with quotes from the interviews and observations that we conducted in the field.

Chapter 4: Results and Discussion

4.1 Overview

In this chapter, we present the findings from the study on the usability issues surrounding the use of digital financial products in two areas of Ghana. The chapter addresses themes that emerged from analyzing the data and responds to the study's two research questions: (1) How do Ghanaians living in peri-urban communities use digital financial products? (2) What are the usability barriers Ghanaians living in two areas (urban and peri-urban) face with existing digital financial products? What are the differences, if any, in the usability challenges that users face in the two areas?

4.2 Research Findings

4.2.1 Common Use Cases for Mobile Money in Berekuso

Sending and receiving money emerged as the most common use cases among all the participants of the semi-structured interviews in Berekuso. In this regard, participants described mobile money as “good” mainly because of how the technology has made it more convenient for the users to send and receive money. Participants also reported that mobile money is faster and easier to use for financial transactions compared to traditional banking. A convenience store attendant said the following to describe how mobile money has disrupted their experience with financial services: *“Mobile money is more convenient for me. I don't have to go to the bank or an ATM [Automated Teller Machine] to check my balance, withdraw money, or deposit money. Sometimes too, mobile money dashes [gives] me coins [interest].”* Another respondent, who works as a security guard, also added: *“I use mobile money to send money to my family, especially my daughter who is in school.”*

Other use cases that participants reported during the semi-structured interviews included buying airtime and electricity credit, paying bills and school fees, accessing loans, purchasing insurance, and making savings. One participant in Berekuso who works as a janitor shared: *“I like mobile money because it makes it easy [for me] to pay [bills] when I go out; even when I don't have cash on me. Sometimes I can go to buy something and realize that the money is not enough, so I just ask the seller if I can send them the rest of the payment using MoMo [mobile money].”* Another subject, a grocery store owner said: *“Mobile money is good. As for MoMo, when I want to buy something I'll just go even if I don't have cash. I can pay right there if the person is on MoMo [mobile money]. For the bank, not everyone has their app so I would have to transfer my money from the bank to my MoMo first.”*

Another participant gave us rich insight into how they use mobile money both as an agent and a regular user. As a regular mobile money user, the participant gave an account of how they can easily access credit using mobile money. The participant said: *“Mobile money allows me to get a loan instantly. Right now if I want a loan, MTN will give it to me very quickly. I don't need a guarantor. The bank will not give it to me [instantly].”*

Our findings on the popular use cases for mobile money in Ghana are consistent with previous work discussed in [3] and [36]. However, purchasing insurance, accessing loans, and making savings through pension funds were other use cases for mobile money in Ghana that were not widely discussed in the literature. These use cases were particularly common among employed participants of this study.

4.2.2 Usability Issues from the Contextual Inquiry in Madina

Confusing monetary input fields leading to errors: Challenges with entering monetary figures were prevalent among urban participants that we observed using the Ecobank mobile app during the contextual inquiry. During the observations, 3 participants completed the money transfer task in two to three attempts. We also observed participants adding zeros as they tried to enter the correct amount required for the task. One participant, an electronics seller at the market, told us: *“The amount field could be more straightforward. I don’t have to enter 2.00 with the dot and the zeros. I can just type 2 for 2 [Ghanaian] Cedis.”* An agro-inputs dealer in Madina who encountered the same challenge said: *“I don’t like the way I have to enter the digits [zeros] when I want to send money. I don’t have to enter many zeros. The 0.00 looks like a balance; it’s confusing.”*

Later during the inquiry, we observed a mobile phone technician who entered 20 Cedis and 2.20 Cedis before typing the correct amount of 2 Cedis. Unsurprisingly, the participant recounted how it was easy to send the wrong amount of money using the Ecobank app: *“Specifying the amount I needed to send was very hard and confusing. I would have transferred more than I needed to send.”* While confusing monetary input fields were a frequent usability issue among urban participants of the contextual inquiry, the usability studies we reviewed for this research did not discuss similar challenges.

Mismatches between user mental models and the design of the user interface: Mental models are expectations about a product, device, or software that users construct in their minds based on beliefs, assumptions, and past interactions with similar apps [23]. Mismatches between user mental models and digital products result in errors or mistakes, confusion, and frustration [17]. One of the pressing usability issues we observed from the contextual inquiry

in Madina was the mismatch between the design of the Ecobank app and the existing mental models that users have developed for sending money to mobile money accounts. Consequently, 3 out the 10 participants encountered errors because they forgot to enter the required amount during the money transfer transaction. One participant who encountered this issue told us: *“You forget about the amount, but you will fill in all the other parts [input fields].”* Another subject said: *“The transaction failed because I forgot to enter the amount. I just pressed [tapped] continue.”*

A user flow is a path consisting of a series of steps that users go through to complete a task in an app. Our observations from the contextual inquiry revealed that participants were used to entering the amount they would like to send at a later stage in the user flow. The trend was common among participants using the mobile money apps from MTN, which prompted users to enter the amount on a different menu or screen. The design of the Ecobank App, however, suggested that users were supposed to enter the amount first. Yet, the Ecobank App did not enforce this first requirement, allowing users to fill in other input fields in the lower section of the screen. Consequently, participants forgot to specify the amount at the very top of the interface, and instead, scrolled to the lower section of the screen to fill other input fields (see Figure 4.1). Thus, participants tapped the “Continue” button on the interface because the app did not issue a warning or error message immediately. Later, participants encountered an error message that delayed the completion of the money transfer transaction because users forgot to enter the amount earlier.

We attribute the error that users encountered to the fact that the app did not warn users when they forgot to enter the amount. Communicating errors to users in an interface is good practice that helps in completing tasks faster. However, providing warnings to prevent users

from encountering errors that arise from conscious mistakes further improves usability [24, 26]. Furthermore, according to Balan et. al. [2011], a usable digital financial product or system has to allow users to complete transactions more quickly. However, we noticed that the Ecobank app did not satisfy this usability criterion, particularly during money transfer transactions from a bank account to a mobile money wallet.

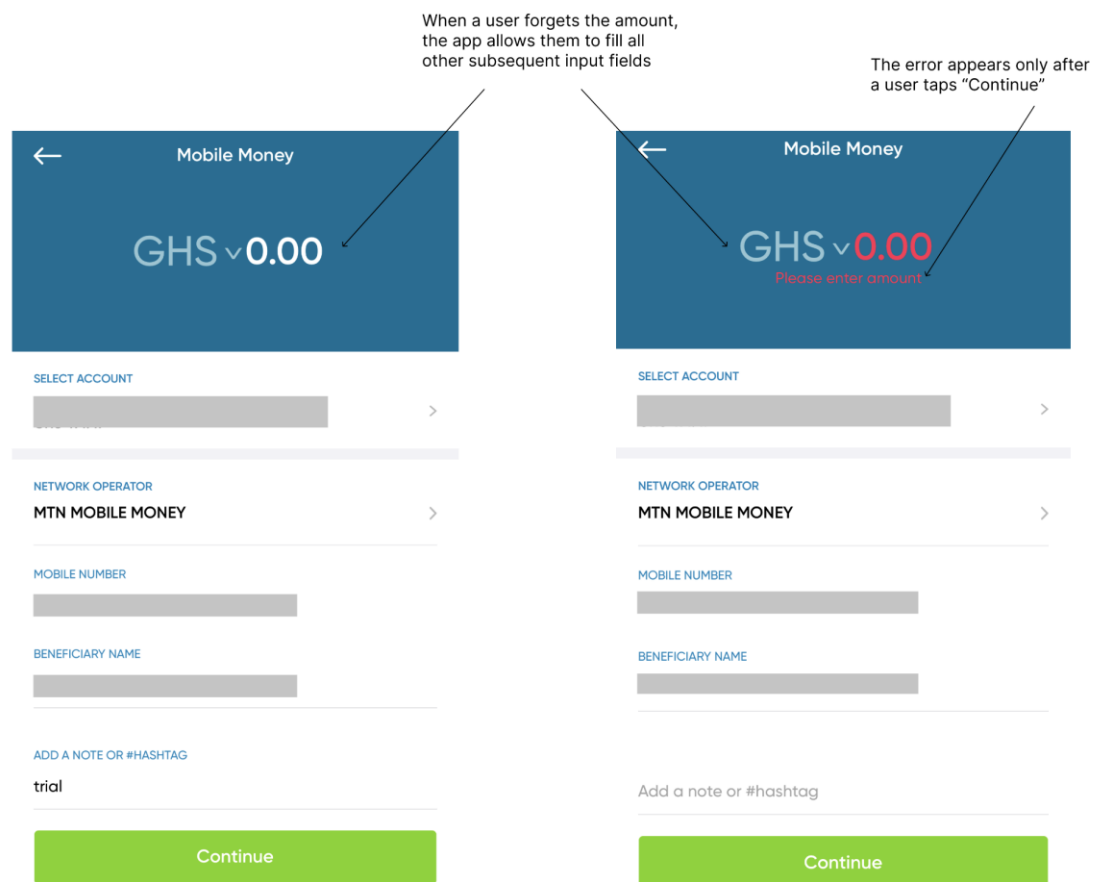


Figure 4.1: Screenshots showing the input fields users have to fill to send money to a mobile money account using the Ecobank App (the interface state with the error is on the right)

It is also worth mentioning that similar usability studies [3, 20, 36] did not discuss errors emerging from the mismatch between user mental models and the design of the interface.

Nevertheless, Balan et al. [3] acknowledged that users can get confused when designers do not incorporate existing mental models in their designs.

Usage of some unfamiliar iconography on the user interface: Icons convey ideas or meanings more quickly than text, contribute to the visual aesthetics of the interface, and save space. Users understand icons based on previous experiences and easily misinterpret the meaning of new or unlabeled icons [12]. During the urban contextual inquiry in Madina, subjects complained about the usage of the “plus icon” to communicate that they were required to enter a recipient’s phone number that was not already saved on the device. One participant said: *“The plus icon is confusing and misleading. It seems like you are required to add [create] a new contact. It could be something else.”* After describing the issue, the participant opened the Phone App on their Android phone and showed us the “keypad icon”, an icon they user expected on the interface (see Figure 4.2).

Several icons do not have a standard usage; as such, labels minimize confusion [12]. However, as seen in Figure 4.2, we observed that the “plus icon” in the Ecobank app is not labeled. Also, as the participant rightly noticed, the Ecobank app does not use the keypad icon, which is conventionally used to communicate that phone number input is expected in an interface. The use of unfamiliar icons in digital financial products is another usability challenge that emerged in our research, but was not reported in other studies we reviewed.

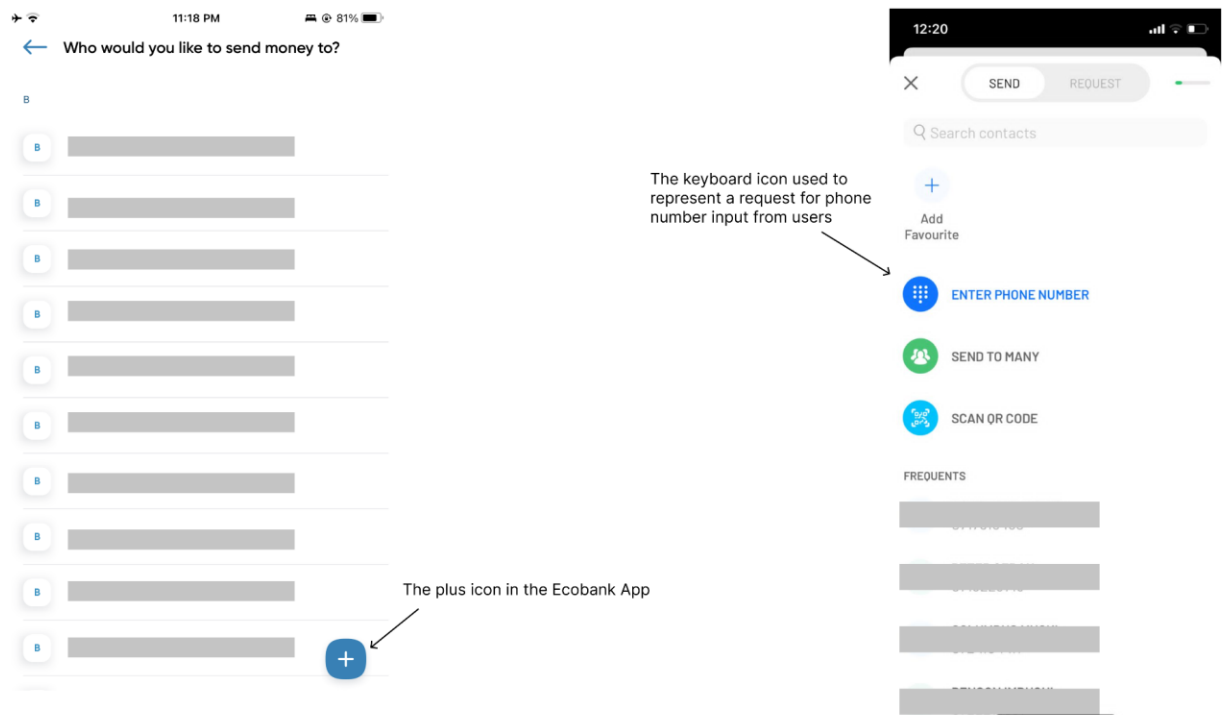


Figure 4.2: Screenshots showing iconography used to request for phone number input (the plus icon in the Ecobank App is on the left and the described keypad icon on the right)

4.2.3 Usability Issues from the Contextual Inquiry in Berekuso

Long lists of instructions: Some participants from the contextual inquiry in Berekuso complained about the long list of instructions they have to go through on the USSD application. One respondent from the semi-structured interview said: *“The USSD [app] has a long list of instructions. But the [MTN Android] app is very easy for me to use. It is very fast and it has clear icons, which I can just tap on depending on what I have [or want] to do.”* Further observations revealed that some participants memorized the numbers or options for the services they use frequently on the mobile money app for USSD. For example, we had an encounter with one participant who selected the wrong option when they were completing the money

transfer task on MTN mobile money app. Instead of selecting Option 1 (“Transfer Money”), the correct option for initiating a money transfer transaction, the participant selected Option 2 (“Momo Pay & Paybill”) on two occasions (refer to Figure 4.3 for the options). We believe the memorization issue emerged because our interaction with the participant revealed that they were participant was less fluent in English. This language issue is consistent with the observations that Medhi et al. [2009] made. Again, Medhi et al. [2009] found that less fluent users struggle to read so much text on an interface that is predominantly in English [20].

Some participants complained about their transactions being slowed down as they had to read the long list of instructions when using mobile money on USSD. One respondent said: *“The instructions are many. It takes time to do transactions and USSD slows things down when in a hurry.”* Another participant whom we observed using both the USSD app and the MTN Mobile Money Android app in the peri-urban context said: *“Sending money using the app is faster. I can send money in a few steps unlike the USSD [app], which requires a long list of options.”*

During the contextual inquiry, we noticed that the long lists of instructions slowed users when checking the account balance. As shown in Figure 4.4, the “check balance” option on the USSD app is found under Option 6 (“My Wallet”). Consequently, participants had to read the entire list of options to locate “My Wallet”, so that they could check the balance (see Figure 4.4). Too much text on an interface increases the cognitive effort that people need to use [36]. Our observations on the usage of too much text on the USSD interface are similar to the observations that Yu and Ibtasam [2018] made on how the usage of so much text to display information increase the cognitive load for users.

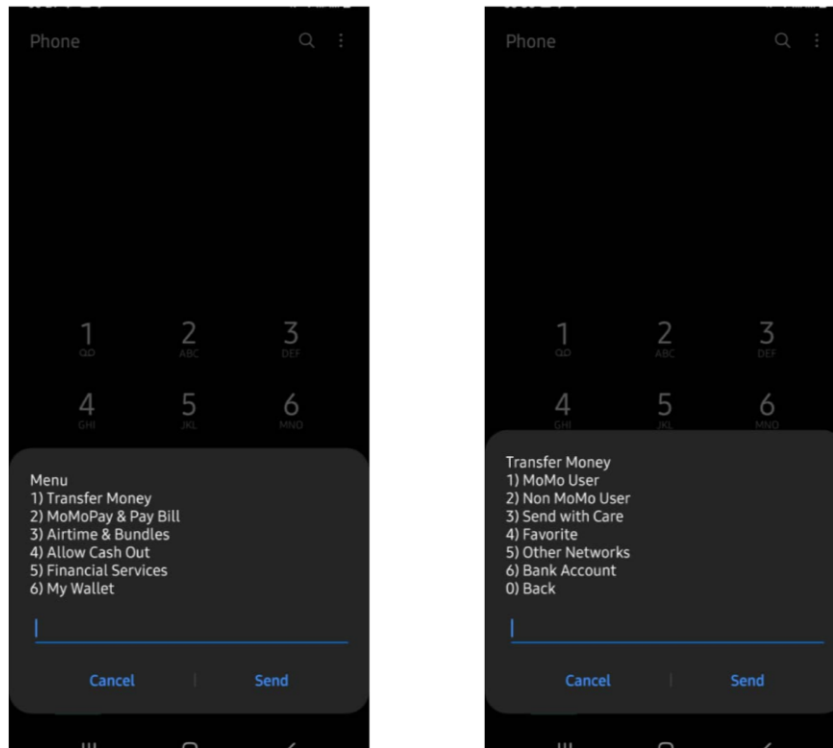


Figure 4.3 Instructions that users have to read when transacting on MTN USSD

No recovery from errors and provision of useful feedback: Another usability issue we observed in Berekuso was that the USSD app did not help users to recover from errors. Participants were forced to cancel the session and restart the app each time they made mistakes, such as entering the wrong amount or phone number. Some participants complained that restarting the process was too much work as the app did not allow them to return to the home menu after making mistakes. On two occasions, participants described that the mobile money app on USSD did not provide them with useful feedback when a transaction failed. One respondent said: *“When doing transactions, sometimes it just says system failure; if there’s an emergency you would be stranded.”* Since participants were afraid of making mistakes, we

observed them copy and paste phone numbers when the app asked them to confirm the recipient's phone number.

Mismatches between user mental models and the design of the user interface:

Again, the mismatch in mental models was widely observed in the urban contextual inquiry at Madina. On the other hand, we only had one instance of the issue on the Ecobank app with a convenience store operator in Berekuso. Unlike other participants, the convenience store operator forgot to select the mobile money service provider that the recipient uses.

Onboarding challenges: One respondent in Berekuso gave an account of how they once struggled to register on the Ecobank mobile app. The participant told us: “... *the Ecobank's app registration was hard. They didn't explain some numbers well. If I didn't ask someone for help, I wouldn't have known how to do so [register].*” Complicated onboarding procedures were discussed as a usability challenge in [20], one of the studies we reviewed for this research.

4.2.4 Other issues that emerged from Berekuso

Other issues that we observed from the study in Berekuso include security concerns in the MTN mobile money app on Android, network challenges, onboarding issues, the need for user-initiated transaction reversals, and the lack of transparency in transaction fees. While some of these challenges are not usability issues, we believe they may have an effect on the user experience.

Lack of transparency in transaction fees: During an interview with a participant in Berekuso, we learned more about the tariffs that MTN customers incur when sending money. The participant complained about the inconsistent fees that MTN charges on the two accounts

the user has with the mobile money service provider. When asked about the challenges the participant faced while using mobile money, the participant responded: *“Transaction fees are confusing. I have two mobile money accounts with MTN, but they get charged differently [different amounts]. On one account, I get charged 50 Pesewas if I am sending money between 1 Cedi and 50 Cedis; Transactions above 50 Cedis get charged 1%. On my other account, all transactions above 5 Cedis get charged. For example [on the other account], 1 Cedi does not get charged. 10 Cedis gets charged 1% of it. But I get charged 50 Pesewas, instead of 10 Pesewas.”*

During the contextual inquiry, we observed the participant transfer money using both accounts to confirm the issue, and we confirmed that the description of the tariffs was correct. After the interview, we visited the MTN to check recently published mobile money tariffs. See Figure 4.4 for the most recent tariffs, which we accessed on March 10, 2022.

Fees			
Transaction Point	Services Type	Transaction Limit (GHC)	Charges (GHC)
At Merchant's/ Agent	Registration		Free
At Merchant's/ Agent	Money Transfer	1 – 50	2.50
At Merchant's/ Agent	Money Transfer	Above 50	5%
At Merchant's/ Agent	Cash-out	1 – 50	0.50
At Merchant's/ Agent	Cash-out	Above 50	1%
On Mobile	Money Transfer (P2P)	1 – 50	0.50
On Mobile	Money Transfer (P2P)	Above 50	1%
On Mobile	Money transfer (A2C)	1- 50	1.50

Figure 4.4: MTN Mobile Money tariffs (source: <https://mtn.com.gh/momo/personal>)

Network problems: Three respondents cited network challenges. One respondent told us: *“Jamming in the network is inconvenient. [There are] longer loading times when I am in areas with a poor network. It gets challenging when the network is weak and the device has a poor network reception.”* Another participant had this to say about the network issue: *“Sometimes the network is slow. Some time back, I was trying to send money but it didn't go through. The limit is 500 Cedis, but I was trying to send 500 and it didn't go through. I called customer care, but they didn't help.”*

Buffering of the MTN Mobile Money App for Android: During the urban and peri-urban contextual inquiries, we also observed that the MTN app on Android phones buffers (reloads) for a couple of seconds each time a user initiates a task. While no participant raised this issue, we considered the behavior of the app unusual. Since we made this observation in two different locations, the closest technical explanation we have for the issue is that the app seemed to retrieve information from the database.

Security issues: Security concerns emerged during the contextual inquiry and the semi-structured interviews. We observed that the MTN app on Android only requested the security code when logging into the app. The app did not request for a security code during the money transfer transaction. Also, one respondent had an issue with the app displaying the balance before entering a security code: *“The [MTN] MoMo [mobile money] app has a problem. It shows the balance before I enter the PIN. Imagine I'm around so many people that I don't even know, and someone asks me to send them money. If there's a robber around me, I can easily be the target because they'll think I have money.”*

The need for transaction reversals: Some participants raised the need for user-initiated transaction reversals. When asked what could be done to improve their experience with mobile money, one participant in Berekuso responded: *“USSD can improve by enabling users to retrieve their own money if they sent it to the wrong person. We should be able to reverse transactions instead of waiting for the customer service people to respond.”* Another participant who uses mobile money as a regular user and a mobile money agent said: *“Sometimes I don't get a notification that a transaction was successful, so I end up sending the money twice. It takes longer to retrieve that money back. I've also had instances where I sent money to the wrong person because the sender didn't know the name of the person they were sending to [the recipient's name], so they told me to just send it anyway. And then they came back to say I didn't send money to the right person.”*

4.3 Differences in the issues identified in the two contexts of the study

To summarize, we observed that most users in Madina faced monetary input challenges because the interface required them to add more zeros for the amount to be correct. We also found that there is a mismatch in mental models between users and the Ecobank app interface. Consequently, most users often forgot to enter the amount they needed to send. Furthermore, some participants at Madina Market complained about the use of unfamiliar icons on the Ecobank app's interface.

In Berekuso, the mismatch in mental models between users and the Ecobank app also emerged. However, this issue was more common in the urban context at Madina. Usability challenges that were common for participants in Berekuso are long lists of instructions and the lack of useful feedback or recovery on the USSD interface for mobile money apps. Only one participant in Berekuso gave an account of onboarding challenges on the Ecobank app, yet this

challenge did not emerge in the contextual inquiry in Madina. Table 4.1 highlights the differences in the usability issues that we identified in the two areas.

Table 4.1: Differences in the usability issues identified from the two contexts of the study

Usability issues from Berekuso	Usability issues from Madina
Long lists of instructions	Confusing monetary input fields
No recovery from errors and provision of useful feedback	Mismatches between user mental models and the design of the user interface
Mismatches between user mental models and the design of the user interface	The usage of some unfamiliar iconography
Onboarding challenges	

Chapter 5: Conclusions

5.1 Overview

This thesis explores the usability challenges that users in urban and peri-urban contexts in Ghana face while using digital financial products. With the objective of making recommendations for improving the usability of digital financial products, the study seeks to address two related research questions: (1) How do Ghanaians living in peri-urban communities use digital financial products? (2) What are the usability barriers Ghanaians living in two areas (urban and peri-urban) face with existing digital financial products? What are the differences, if any, in the usability challenges that users face in the two areas?

Being the final section of the thesis, this chapter summarizes the study, addresses the research questions, and identifies the limitations of the study, which can inspire future research. The chapter also discusses recommendations for improving the usability of digital financial products and presents a prototype interface that puts the research findings to use.

5.2 Summary of research findings

Using semi structured-interviews and a contextual inquiry, the study identifies the usability challenges that users in Madina (an urban market area) and Berekuso (a peri-urban area) encounter when using digital financial products. Focusing on mobile banking apps (the Ecobank app) and mobile money apps from MTN, the study also identifies use cases for mobile money in Ghana and discusses the differences in the usability issues that users in urban and peri-urban contexts face when using digital financial products.

(1) How do Ghanaians living in peri-urban communities use digital financial products?

Sending and receiving money emerged as the popular use of mobile money in Ghana. Other use cases that we identified include purchasing airtime, paying bills, buying electricity credit, accessing loans, purchasing insurance, and making savings through pension funds. Common sentiments among participants were that mobile money helps in completing financial transactions more quickly, more easily, and more conveniently compared to traditional banking.

(2) What are the usability barriers Ghanaians living in two areas (urban and peri-urban) face with existing digital financial products? What are the differences, if any, in the usability challenges that users face in the two areas?

The usability issues that emerged from the study include confusing monetary input fields, the usage of unfamiliar iconography, and gaps between user mental models and the design of the interface. These issues were particularly prevalent in the urban context at Madina Market, which analyzed the usability of the Ecobank app. Users made monetary input mistakes on the Ecobank mobile banking application because the app did not provide warnings that could prevent them from making mistakes that can cause errors. Our study in Madina also reveals that users can encounter errors when the designs of fintech apps do not match their mental models. In the case of the Ecobank app, users easily forgot to enter the amount because of a slight change in the process of transferring money from a bank account to a mobile money wallet. Our study also found that the usage of unfamiliar iconography without helpful labels can lead to confusion in digital financial interfaces since most icons do not have universal or standard meanings.

Long lists of instructions and the lack of useful feedback and recovery options when users make mistakes were the common usability challenges in the peri-urban context of

Berekuso. We found that presenting long lists of instructions on the USSD interface can slow users in completing their goals because reading a lot of text increases the cognitive load by requiring more attention from users. In Berekuso, the study also found that the USSD mobile money app does not help users to recover from errors, forcing them to cancel a session and restart the app each time users make mistakes, such as entering the wrong amount.

Non-Usability Issues Identified from the Study

The lack of transparency in transaction fees is one of the non-usability issues that we identified in this study. We encountered one participant in Berekuso who complained about the inconsistent fees that MTN charges on their two accounts mobile money account with the same service provider. Some participants also encountered how poor network affects their experience when using mobile money. During the study, we also observed that the MTN mobile money app for Android devices buffers (or reloads) whenever users initiate new tasks. Since we made this observation at both sites of the study, we argue that the behavior of the app was unusual because it did not seem to emerge as a result of network challenges.

Other issues that emerged from the study are security concerns and the need for transaction reversals. In particular, we observed that the MTN app on Android only authenticated users when logging into the app. Thus, the app did not request for any security code during the money transfer transaction. Lastly, we found an increasing need from user-initiated transaction reversals

5.3 A prototype interface that puts some of these findings to use

Focusing on the money transfer use case, which was most popular among our study participants, we put the findings from this study to use by designing a prototype interface for sending money. We used a design tool (called Figma) to design clickable or high-fidelity prototypes after conceptualizing the interface using paper sketches or wireframes. Figure 5.1 shows some screens of the prototype interface that we designed in two main iterations. In the interface, we implement the design of the user flow that matches the user mental models we identified during the study. Specifically, we achieve this by minimizing the amount of input requested from users on a single screen while allowing them to specify the amount to be sent after providing a transaction reason and the contact of the recipient (see Figure 5.1 and Figure 5.2). We also label all icons on the interface to improve usability and reduce ambiguity.

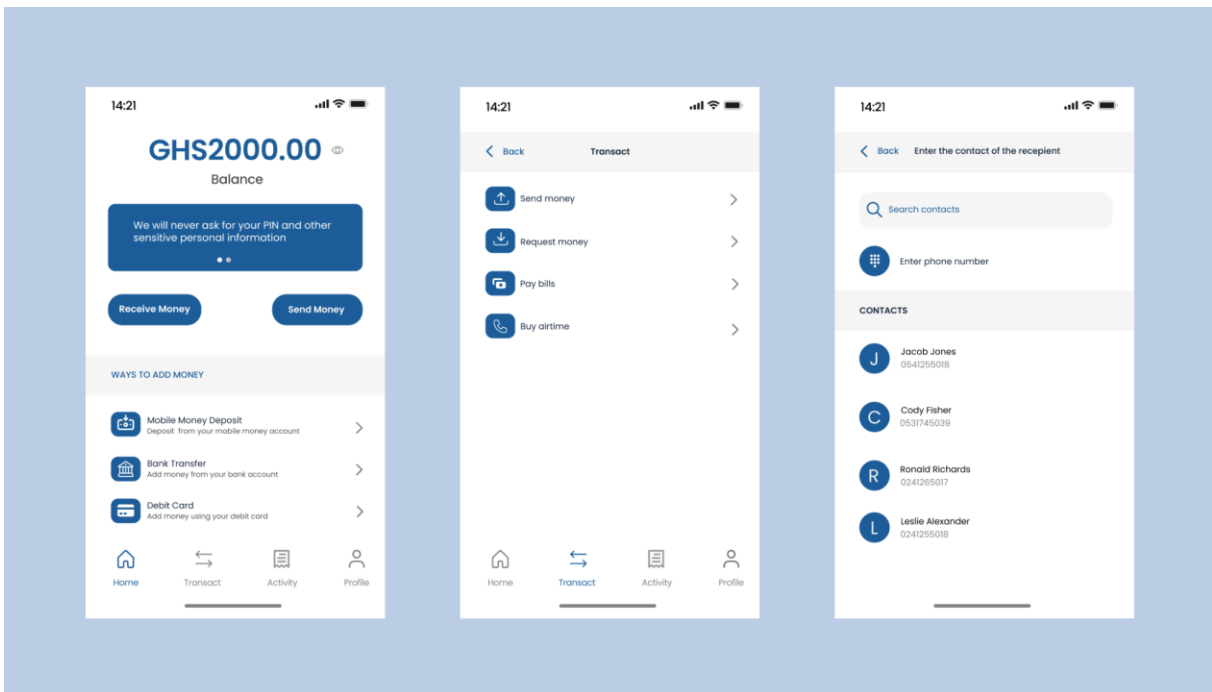


Figure 5.1: The interfaces for the “Home”, “Transact”, and “Enter Contact” screens of the app

The prototype interface we designed ensures that users enter the amount of money to be sent immediately after providing the reason of the transaction. We achieve this constraint in the interface by greying out the monetary input field and the “Send Money” button to inform users that they are supposed to provide the reason for the transaction before proceeding. Also, instead of only labelling the input field for the transaction reason with the term “Reference”, the prototype interface informs users to enter the reason for the transaction by adding a more descriptive label: “Add a note for the transaction” (see Figure 5.2).

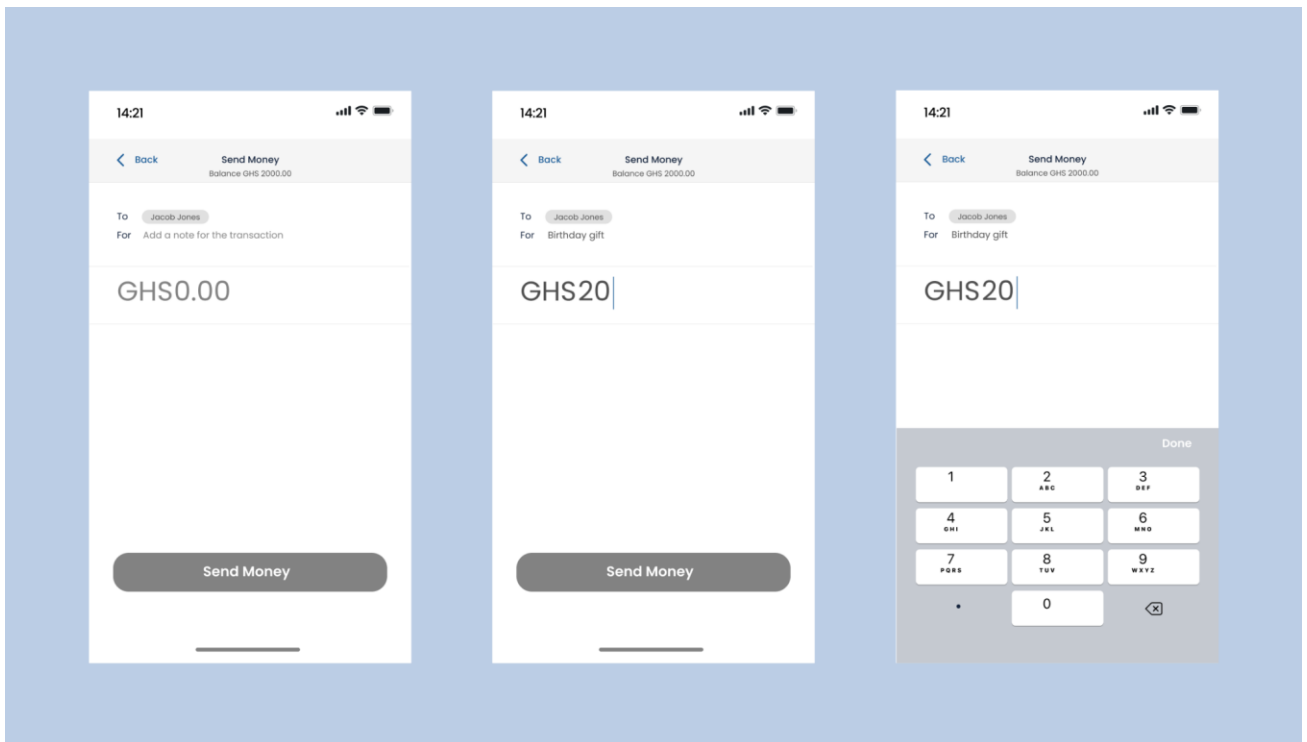


Figure 5.2: Interfaces showing constraints to be met before entering the amount

Furthermore, the prototype we designed provides flexibility. For example, as shown in Figure 5.1, users can initiate a money transfer transaction either on the “Home” screen or the “Transact” screen. On the “Home” screen, users can tap on the “Send Money” button and

proceed with the process. Alternatively, users can also initiate the same transaction by tapping on the “Send Money” icon in the “Transact” screen.

Figure 5.3 shows that users can change the amount without the need of restarting the entire transaction. The “pen icon” besides the amount communicates this to users on the interface. To enforce security, the prototype screens in Figure 5.3 also show that users are required to enter a four-digit security code before completing the transaction.²

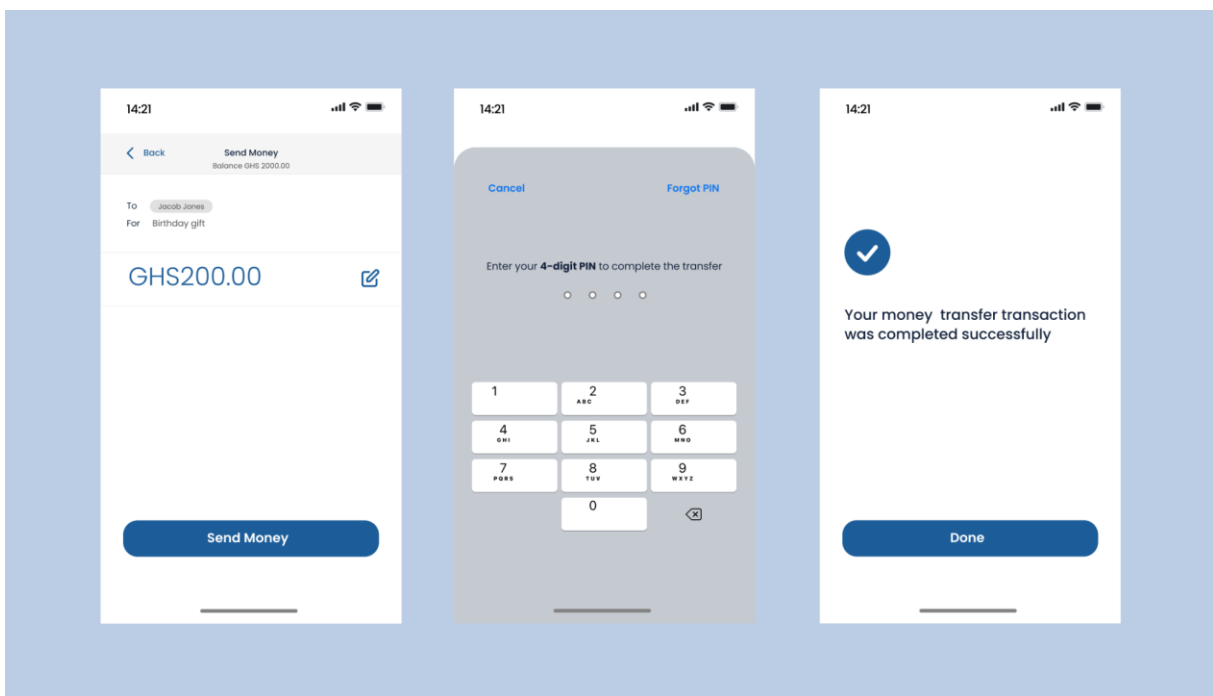


Figure 5.3: Interfaces where users can change the amount to be sent and confirm the transaction

² The clickable versions of the prototypes in Figures 5.1 to 5.3 are available in Appendix A

5.4 Recommendations

- Designers and developers should conduct research to understand existing user mental models for commonly used digital financial applications, including mobile money and mobile banking apps.
- Since icons can have several meanings, user interfaces should provide appropriate labels to avoid confusion. Conducting user research can also improve the usability of icons.
- Test designs with users in their natural environments to identify usability issues earlier in the product development process. If actual users are not available, designers from fintech can use the ten usability heuristics (principles) or other usability evaluation techniques discussed in [22, 25].
- Use constraints to help users from making mistakes that result in errors.
- Use minimalist design to reduce the amount of text used on the interface. Designers can also reduce clutter on the interface by using icons and other visualizations to communicate ideas. Service providers for USSD applications can also prioritize the display of options for commonly used transactions, such as sending money and checking the balance, at the top of the screen. Related options that are rarely used can be grouped at the end to reduce the number of options that users have to read before selecting a type of transaction.
- Provide error messages that can help users understand the errors and correct them to continue with the transaction.

5.5 Study Limitations

Due to time and budget constraints, this study explored the usability issues in three digital financial applications — MTN Mobile Money USSD, MTN Mobile Money Android App, and the Ecobank mobile app. All the apps we assessed in the study are from two leading service providers, Ecobank and MTN. Therefore, we may not generalize the usability issues identified in the study to other digital financial applications used in Ghana.

5.6 Future Work

Future studies can assess usability issues in other digital financial apps. Other studies may focus on the challenges users encounter in digital financial apps from providers other than Ecobank and MTN. Future studies may also use other appropriate HCI research methodologies that we did not use in this study.

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Appendix A

Clickable Prototype Designs

Clickable interface prototypes are available in Figma (see the link below). Click on the drop-down arrow next to the Figma logo in the upper left corner of the screen to navigate various design file pages. <https://www.figma.com/file/GDKRwuzeq15XqPsFOMKGcz>

Appendix B

Research Protocol

We are final year students studying Management Information Systems at Ashesi University. We are researching to understand the usability issues Ghanaians in Berekuso and Madina Market encounter as they use digital financial products. We would like to ask for your permission to participate in this study. Your participation is voluntary, and it does not involve any risk. If you agree to be part of this study, you are free to discontinue your participation. Your participation will contribute knowledge on the issues people face as they use digital financial apps, such as mobile money while enabling us to understand how to make these technologies easier for everyone.

For further information about our study, you can contact our supervisor Mrs. Rebecca Awuah at rawuah@ashesi.edu.gh. The Ashesi IRB has reviewed this study and the Consent Form for Human Subjects Research. For further information, contact the committee at irb@ashesi.edu.gh.

Participants' Consent Form

We would like to ask your permission to be part of this interview research study that seeks to identify usability issues in digital finance products. This Official Consent (“Consent”) made on (Date) by (Researchers) **June Rose Etyang and Ernest Makaika** and (“Consenter”) who consents to the following:

- To be a part of this research study by providing accurate information and answers based on the questions asked by the researchers, **June Rose Etyang and Ernest Makaika**, students of Ashesi University.

- Participation in this study is voluntary, and the participant may withdraw at any time during the study.
- The participant should note that there will be no benefits or rewards for participating in this study.
- The participant has a choice to decline to answer any questions they may be uncomfortable with.
- Personal details about the participant will not be published against their will and acceptance.

For further information, you can contact our supervisor, Mrs. Rebecca Awuah, at rawuah@ashesi.edu.gh.

Ashesi IRB has reviewed this study and the consent form for Human Subjects Research. For further information, contact the committee through irb@ashesi.edu.gh

Consenter's Signature: -----

Date: -----

Researcher's Signature: -----

Date: -----

Interview Questions

1. Which age group do you fall in?
 - 18-24
 - 25-30
 - 31-35
2. Do you own a mobile phone?
3. What type of phone do you own?
 - Feature Phone
 - Smartphone
4. Are you registered on mobile money?
5. Which mobile money service provider do you use?
6. Have you completed secondary education?
7. What apps do you use when doing financial transactions?
 - MTN MoMo App
 - Banking Apps
8. For what purpose do you do financial transactions on your phone?
 - Paying bills
 - Saving
 - Checking your balance
 - Insurance
 - Sending money
 - Withdrawing
 - Airtime

- Other: -----

9. How often do you do financial transactions on your phone?

- Everyday
- Several times a week
- Monthly

10. Do you have a bank account?

11. If yes, what benefits do you get from using mobile money that your bank does not offer?

12. How would you evaluate your experience using mobile money?

13. What are the challenges you have faced while using mobile money?

- Prompt them to give another challenge if they just give one challenge

14. Do you think that mobile money is more costly than traditional banking?

15. Have you ever experienced fraud?

Questions for the Contextual Inquiry

1. Do you own a mobile phone?
2. What apps do you use for financial transactions?
3. Which age group do you fall in?
 - 18-24
 - 25-30
 - 31-35
4. Was there anything surprising or unexpected about the app?
5. What was the most challenging thing when you were using the app?
6. What could be done to improve the app?