Design and evaluation of a mobile application interface for stokvel groups: An Eastern Cape case study.

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Plagiarism Declaration

I, Masharty Tembo, hereby declare that the dissertation/thesis submitted is based on my original work (except where acknowledgements indicate otherwise). Neither the whole work nor any part of it has been, is being, or is to be submitted to any other institution of higher education. I understand the meaning of plagiarism and declare that all of the work in this dissertation is either my own or has been properly acknowledged.

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Abstract

This dissertation investigates the potential use of mobile applications to facilitate the management of Stokvels - informal savings groups - in rural South African communities. Amid challenges like mismanagement, lack of transparency, and constraints posed by the COVID-19 pandemic, digital solutions may offer effective remedies. The research seeks to comprehend the functioning of Stokvels, explore the activities that foster social capital, and design a user-friendly mobile application prototype through usability testing and qualitative thematic analysis of focus group data. The study adopts a user-centred approach involving initial requirement gathering, artefact creation for usability testing, and high-fidelity prototype evaluation. Data was collected through a focus group from the Imijelo Yophuhliso Foundation, and a WhatsApp chatbot prototype was tested and refined iteratively. Key findings revealed that users needed a comprehensive platform for record-keeping, improved communication channels, and an efficient loan request system. Despite the existing digital divide, a readiness to adopt technology was evident. Usability testing of the prototype yielded a 100% task completion rate, pointing to a solid foundational design, but also identified areas for improvement. Activities fostering social capital, like shared group identity, progress monitoring, effective communication, shared financial responsibility, and mutual aid, were identified as critical for integration into the mobile application. The study contributes significantly to the literature on digital financial inclusion, usability testing, and the role of mobile technologies in poverty alleviation. However, limitations such as language barriers, a short research timeframe, and a focus on a specific type of Stokvel warrant attention for future research. This study holds implications for similar communities in South Africa and other parts of Africa and researchers interested in digital adoption in informal institutions in low-income areas.

Table of Contents

Chapter 1: Introduction

The proliferation of digital technologies, particularly mobile devices and applications, may facilitate and enhance various sectors in South Africa, including managing Stokvels in rural communities (Elliott, 2019; Murugesan, 2013). Stokvels are savings groups known as Rotating Savings and Credit Associations (ROSCAs), informal savings clubs typically found in South Africa and other parts of Africa. They are characterised by regular contributions from members and periodic distributions of pooled funds (Mashigo & Schoeman, 2012). These clubs have played an essential role in the economic and social lives of households and communities in South Africa, particularly in rural areas in the Eastern Cape, by providing access to credit and insurance. Stokvels also serve as a social safety net and a source of social capital (Matuku & Kaseke, 2014), which may be defined as the trust, information, or benefits people gain from their social networks (Putnam, 1995)

Bophela and Khumalo (2019) and Matuku and Kaseke (2014) have noted that traditional stokvels can be time-consuming and prone to mismanagement, lack of transparency, or fraud. Additionally, stokvels face challenges and opportunities in the digital age. These include (but are not limited to) the need to adapt to changing regulatory and technological environments and the potential to leverage digital technologies to improve efficiency and transparency (Matuku & Kaseke, 2014). During the Covid-19 pandemic, the National Stokvel Association of South Africa (NSAS) required suspending all Stokvel meetings to limit the virus's spread. As a result of the pandemic, unemployment in South Africa increased by approximately 6.4 percentage points between the fourth quarter of 2019 and the second quarter of 2020, according to the International Labour Organization (2020). Consequently, this increase in unemployment led to a rise in the number of informal stokvels being formed across the country, with most of these stokvels operating online. Many stokvels, particularly in urban areas, adapted to the situation using digital payments (Mehmood et al., 2019). However, the lockdown hindered the ability of Stokvel members without access to online tools to keep track of Stokvel activities and continuously build on social capital since they could not meet physically.

Smartphone penetration is expected to grow in South Africa, with organisations like Vodacom and Google working to reduce the digital divide in deep rural areas by providing smartphones free of charge (Vodacom, 2021). Previous studies (Chinedu, Taylor, & Huisman, 2019 and Murugesan, 2013) illustrate that mobile communication and innovative application usage can alleviate poverty in parts of Africa (Elliott, 2019). The adoption of mobile technology has also been documented to reduce the impact of time and effort required to reach a wider audience and increase transparency (Mashigo & Schoeman, 2012). However, the potential use of mobile applications to facilitate the management of Stokvels in rural communities in the Eastern Cape, South Africa, has not yet been fully explored due to challenges such as low levels of literacy, lack of infrastructure, bandwidth constraints, and regulatory barriers, which ultimately lead to a digital divide (Murugesan, 2013). This demonstrates the need for further investigation into how readily available technology, such as mobile applications, can ensure these informal institutions in low-income areas adopt digital practices in their operations.

1.1 The prevalence of stokvels in South Africa

Stokvels are prevalent in lower-income regions where individuals have limited access to financial services in the formal sector. There are an estimated 811 130 stokvels in South Africa with a total membership of approximately 11.4 million, at a collective value of R49 billion annually (Tengeh, Robertson & Nkem, 2017). There are different types of stokvels which include (but are not limited to) burial stokvels, investment stokvels, savings stokvels, grocery stokvels, agricultural stokvels and high-budget stokvels, yet stokvels seem to be considered a hidden sector of the economy. Similarly to mobile technology, stokvels are considered a key driver in alleviating poverty and promoting income security (Bophela and Khumalo, 2019).

Although economic empowerment is often cited as the primary motivation for stokvel membership, some studies (Tengeh, Robertson & Nkem, 2017; Mashigo & Schoeman, 2012; Tsibolane & Menze, 2019) have found that social capital also plays a significant role in attracting and retaining stokvel members and contributing to the sustainability of these informal financial associations. Stokvels allow members to make

friendships, establish social networks, learn from one another, discuss personal matters, support each other, and stay informed about significant community events (Matuku & Kaseke, 2014). Social capital is also an essential factor that helps minimise default within these informal groups, often formed without legal binding (Mehmood et al., 2019).

Given the importance of stokvels as a means of economic empowerment and the potential role of social capital in attracting and retaining members, it is clear that further research is needed to understand better the factors that contribute to the sustainability of these informal financial associations. The next section will outline the aims and objectives of the study, which will seek to build upon the existing literature on stokvels and social capital to provide new insights into this topic.

1.2 Aims and Objectives

This study aimed to explore the potential use of a mobile application to facilitate the management of Stokvels in rural communities in South Africa. The current study's focus was a village called Mcewula, located in the Chris Hani District Municipality of the Eastern Cape, South Africa. The specific objectives of this study were to:

1. understand the functioning of stokvels in the context of Mcewula and highlight the critical activities required to operate remotely;

2. understand the activities that foster social capital in a stokvel and how they could be replicated remotely with the assistance of a mobile application;

3. design and prototype a mobile application for stokvel management;

4. evaluate the usability and user experience of the prototype;

5. and collect and analyse user testing feedback to inform the final application's design and development.

The research questions for this study are as follows:

1. What are the user considerations and interface design implications for a mobile stokvel application in rural South Africa?

2. How can activities that foster social capital be designed into a mobile application?

The significance of this study lay in its potential to inform the design and evaluation of digital financial inclusion initiatives in South Africa, particularly in rural areas. The findings of this study could be significant for similar communities in South Africa and other parts of Africa, where stokvels play an important role in the economic and social lives of households and communities. For researchers, the study could provide insights into how mobile technologies can facilitate the management of informal institutions in low-income areas and promote digital adoption in their operations. Additionally, the study contributed to the overall literature on digital inclusion, usability testing and the use of mobile technologies for poverty alleviation in Africa and inform future research in this area.

1.3 Approach

This study aimed to evaluate a mobile application's usability and user experience for stokvels in rural South Africa. A qualitative research design was used to achieve this, focusing on usability testing and user experience. A user-centred approach was taken in the design and evaluation process. The above-mentioned steps included gathering requirements, creating artefacts for initial usability testing, and evaluating the high-fidelity prototype. Initial data were collected through a focus group with seven members of a stokvel group recruited from the Imijelo Yophuhliso Foundation. The WhatsApp chatbot prototype was developed and evaluated using the "Wizard of Oz" approach, in which the researcher acted as the application's backend, sending instructions and responses to the participants through WhatsApp to mimic the actual application. This stage was carried out with 8 participants, where the prototype was refined iteratively through successive data collection and analysis cycles. A detailed description of the method for each phase can be found in the relevant chapters.

1.4 The organisation of the dissertation

This dissertation is structured into six chapters to address all of this study's research questions and critical factors. Chapter 1 will provide an overview of the background and context, the research problem, the aims and objectives of the study, the approach or methods used, and finally, the study's limitations. Chapter 2 will review the literature on stokvel operations, mobile technology adoption, usability and user experience to provide a foundation for the study. Chapter 3 will describe the methodology and data collection process used in this study, including the research design, sampling, data collection, data analysis methods, and the evaluation of the high-fidelity prototype. Chapter 4 will present the study's results, including the requirements gathered from the focus group and the evaluation of the high-fidelity prototype to determine its effectiveness in meeting user requirements and providing the desired functionality for managing stokvel activities. Chapter 5 will discuss the study's implications and contributions to the literature and the limitations and opportunities for future work. Finally, Chapter 6 will conclude with the main findings and recommendations for future research.

Chapter 2: Literature Review

2.1 Stokvels in South Africa

2.1.1 History of stokvels

The term "stokvel" originated from the stock fairs held in the Eastern Cape during the 19th century, where English settlers auctioned cattle to the local labourers and farmers (Calvin & Coetzee; Irving, 2005; Lukhele, 1990). These fairs provided a platform for the labourers and farmers to socialise, exchange ideas, gamble, and pool money to purchase livestock. Over time, the idea evolved and individuals began meeting at the house of one of the auction participants to contribute a small amount of money into a rotating fund, which the host would save until the next purchase. By contributing these small amounts, the participants would then become members of the stokvel (Schulze, 1996). Members who have yet to receive pay-outs are known as savers, while those who have received funds are known as debtors (Vonderlack & Schreiner, 2002). The early stokvels may be defined as savings clubs that rotated pooled funds among members on a mutually agreed basis, with membership ranging from 5 to 25 people (Verhoef, 2001). In the 1930s, stokvels were brought to Johannesburg townships by black men who migrated to the city to work in the mines and later by their wives, who joined them. Stokvels became a source of financial strength and support for black families during apartheid[1] when women were prohibited from entering urbanised areas without authorisation (Lukhele, 1990). In the 1970s, Kurtz (1973) described the participation of low-income groups in stokvels as an adaptation to severe economic poverty. African women, who lacked stable income and family support during early urbanisation, turned to the informal financial sector to sustain their supporting role within the household (Moliea, 2007; Verhoef, 2002).

Membership of stokvels promoted a sense of unity, regardless of tribal or ethnic affiliations. This sense of unity, in turn, played an instrumental role in bridging tribal and ethnic divisions between urbanised Africans, especially among women who

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[1] Apartheid was a system of institutionalized racial segregation, political and economic discrimination against nonwhites in South Africa and Namibia from 1948 to the early 1990s.

carried the heaviest burden of providing for their families (Lukhele, 1990; Verhoef, 2001). Moreover, stokvels continue to provide financial support for African women, with parties and gatherings serving as an important means of social support (Moliea, 2007; Verhoef, 2002). Stokvels have not only become a vital part of township culture but have also spread across the rest of South Africa. They have been recognised as a crucial source of credit and savings for low-income consumers in South Africa, mainly as a result of the formal financial sector inadequately accommodating the credit needs of its members (Mashigo & Shoeman, 2010). Additionally, stokvels play an essential role in providing access to money, smoothing consumption[2], promoting income-generating activities, and supporting poverty alleviation strategies in South Africa (Mashigo & Shoeman, 2010; Matuku & Kaseke, 2014).

Stokvels may be divided into three main categories (Tengeh & Nkem, 2017). Firstly, they are proprietary informal financial groups. These consist of individuals who offer financial aid by serving as lenders. Secondly, stokvels are staff and social welfare schemes. These are typically formed by individuals who share frequent interactions, such as colleagues, acquaintances, family members, or community members. Lastly, stokvels may function as mutual aid groups such as Rotating Savings and Credit Associations (ROSCAs) and accumulating savings and credit associations (ASCRAs). ROSCAs are informal financial groups where members pool money to save and borrow from each other in a rotating manner, typically found in developing countries. ASCRAs are similar to ROSCAs, but instead of rotating funds, the money is accumulated and distributed to members based on their needs, typically found in African countries. (Aryeetey, Senbet, & Udry, 1997).

These institutions are not unique to South Africa; they are found in many other countries under different names, the most common being ROSCAs. Ardener (1964) and Thieme (2003) show that these institutions have existed globally for at least two centuries and combine the Western ideas of credit and savings with associations' traditional warmth and concern. They have various forms and functions and are prevalent in high financial insecurity and prosperous industrialisation (Ardener, 1995).

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[2] Consumption smoothing is the process of balancing savings and consumption to maintain a consistent standard of living over time.

ROSCAs are among the world's oldest and most widespread savings institutions and play a significant role in savings mobilisation in many developing economies (Bouman, 1995; Gugerty, 2007). Different names for these institutions include *esusu* in Nigeria, *upatu* in Tanzania, *chama* in Kenya, and *tontines* in Cameroon (Kounou et al., 2013), to name a few. However, regardless of name, they all aim to bring members of a community together to contribute resources towards a common goal, whether it is building a community school or accumulating savings and loans for members (Cameron & Ananga, 2015; Flynn & Sumberg, 2018).

2.1.2 Structure and characteristics of stokvels

Stokvels in South Africa, as discussed by Halim (2017) and the National Stokvel Association of South Africa (NASASA) (n.d.), encompass a diverse range of forms, accommodating individuals with varying economic standing and social objectives. These savings and investment clubs are versatile financial tools for communities nationwide. The different types of stokvels include leisure stokvels for recreational savings, savings stokvels for regular contributions, credit stokvels for borrowing and interest-based repayments, funeral stokvels for funding funerals, purchasing stokvels for collective buying power, grocery stokvels for essential household supplies, entertainment stokvels combining economics with social events and luxury stokvels for higher financial standing members seeking substantial returns. Additionally, cooperative buying societies aim to enhance bulk purchasing capabilities and multi-purpose stokvels that evolve to meet various member needs over time. The adaptability and flexibility of stokvels allow them to cater effectively to their participants' diverse requirements and interests (NASASA, n.d.). It is essential to recognize that luxury stokvels are not suitable for individuals with limited financial means, and their membership predominantly comprises males, with few women due to under-representation in high-income positions (Schulze, 1997).

Stokvels are typically structured as social savings groups that bring together community members for social and economic goals. These groups usually consist of 3 to 50 people, with some having several hundred members (Mulaudzi, 2017). The larger groups comprised of people who do not have close ties to each other but can join the stokvel if they are known by at least one member of the group and other members vouch for their character. On the other hand, smaller stokvels are often

comprised of close associates, friends, neighbours, or schoolmates (Bisrat, Kostas, & Feng, 2012). The stokvel elects a committee comprising a chairperson to lead and manage the group's activities, a secretary to keep accurate records of the group's financial transactions and minutes of meetings and treasurer to manage meetings and day-to-day operations. Stokvels' rules and regulations are simple and sometimes written in the local language, especially in rural communities. There are typically no formal processes for entering or exiting a stokvel, although trust is a prerequisite for new members (Mashigo & Schoeman, 2012).

Stokvels are formed for pecuniary gain and can be either savings-based or profit-oriented, as can be seen types of stokvels listed above. Contributions are fixed and regular and funds are distributed equitably among members, who act in their best interests (Verhoef, 2001). The contributions are recorded and may also be used to provide loans. Penalties for late payments and attendance can also generate income for the group. Interest charged on loans is another source of income, which is eventually shared among the members (Bophela & Khumalo, 2019; Cameron & Ananga, 2015; Kedir, 2005; Musinguzi, 2016).

Social connections and interpersonal networks play a central role in stokvels, improving the group's efficiency by facilitating coordinated actions and deepening friendships. While the most cited reason for joining a stokvel is financial considerations, frequently linked to that are social considerations. The social pressures resulting from the social connections and interpersonal networks formed by stokvel members make it difficult for members to spend the money saved, thus helping them achieve their financial goals (Burman & Lembete, 1995). Stokvels have been found to enforce social and economic sanctions on members who default without good reason, making it difficult for them to join another stokvel due to a lack of "social collateral" (Besley, Coate, & Loury, 1993).

2.1.3 Social capital

Social capital is defined as the trust, information, or benefits people gain from social networks. This concept includes dense networks of social interaction generated through civic participation, allowing group members to trust each other and predict

each other's behaviour (Coetzee & Cross, 2002; Saz-Gil, Bretos, & Díaz-Foncea, 2021). These social networks can be formal or informal, strong or weak ties, and homogenous or heterogeneous(Cattell, 2001). Bonding social capital refers to the close networks that develop between relatives, friends, families, and neighbors, while bridging social capital extends into distant networks (Perkins, Hughey, & Speer, 2002; Putnam, 2000; Woolcock & Narayan, 2000). Social networks are considered social resources, which include intangible aspects of everyday interactions, whether symbolic or concrete, such as seeking assistance or advice (Häuberer, 2014). Access to these resources is influenced by the quality of a person's networks, which may be expanded by group membership (Bhandari & Yasunobu, 2009; Söylemez, 2020).

Social capital plays a critical role in stokvels, serving as a socio-cultural dimension that provides security and support to members, which is not typically available through banks or other financial intermediaries (Saz-Gil, Bretos, & Díaz-Foncea, 2021). This value is evident in the willingness of members to forego interest from their savings for the social benefits of the clubs, such as receiving advice on how to save and use money constructively. Additionally, socializing within stokvels fosters a sense of solidarity, enhances social and economic status, and generates a strong sense of trustworthiness among members (Cook, 2019).

Stokvels are characterized by low administrative and transaction costs, as formal record-keeping is not required and officials are unpaid. This low-cost structure is particularly beneficial for poor women, who find stokvels attractive due to these minimal transaction costs, which are maintained through close relationships among members. The operation of stokvels relies heavily on social bonds, with each member typically having at least one close friend in the group, ensuring effective communication and responsibility within the club (Vonderlack & Schreiner, 2002; Saz-Gil, Bretos, & Díaz-Foncea, 2021).

Default is rare in stokvels due to the information and enforcement advantages inherent in close-knit communities, allowing effective screening and monitoring of members' behaviour. Social sanctions, such as exclusion from community networks, serve as a deterrent against default. Members prioritize meeting stokvel obligations to avoid disgrace and humiliation, contributing to a nil default rate. Stokvels leverage sunken

investments in social capital to screen members and enforce contracts, with relationships among members—formed through work, home, or other interactions—resulting in a low default rate (Gugerty, 2007; Söylemez, 2020; Schreiner, 2001).

2.2 ICTs and social capital in developing regions

The relationship between ICTs and social capital in developing regions, particularly in the context of informal savings groups, has been the focus of extensive research. In developing regions, the impact of ICTs on social capital formation can be positive and negative, with potential trade-offs. Social capital relies on creating and maintaining social networks, and the digital divide may hinder its development in areas where access to technology, digital skills, and usage are limited (Haythornthwaite, 2005; Warschauer, 2004). Moreover, the digital divide can exacerbate existing social inequalities. Those with greater access to ICTs and the ability to use them effectively can leverage their social networks for various benefits (T. S. Parikh, 2009). In contrast, those with limited access and skills are left behind (Toyama, 2015).

On the positive side, research on the Indonesian rural economy highlights the significant role of social capital in accelerating economic development through village-owned enterprise management (Aritenang, 2021). ICTs transform customer needs, product and service properties, and organisational design (Snow, Fjeldstad, & Langer, 2017). They can bridge geographic distances, enabling social interaction and communication regardless of time and space constraints (Galloway & Mochrie, 2005; Hansson et al., 2007). Through ICTs, individuals in rural areas can establish and maintain social connections, overcoming distance and transportation challenges (Kujath, 2011). However, ICT-based connections may lack social trust (Townsend et al., 2014).

In the context of informal savings groups, existing social capital among group members positively influences their participation and the overall effectiveness of the groups (Nayak, 2015). Active participation in group activities contributes to the accumulation of social capital, enhancing resource mobilisation and improving the effectiveness of the groups. Social capital can be understood at individual and collective levels, encompassing network capital, bridging capital, and bonding capital

(Brandtzaeg, 2012; Lin et al., 1999). Digital technologies significantly impact operating, controlling, and coordinating organisational activities, providing automation, communication, and collaborative decision-making capabilities (Snow, Fjeldstad, & Langer, 2017). Governments acknowledge the potential of these technologies in enhancing communication with constituents and have embraced their use (Mandarano, Meenar, & Steins, 2010). As digital technologies continue to proliferate, they can shape the dynamics of social capital within informal savings groups by facilitating communication, enabling knowledge sharing, and promoting resource mobilisation. ICTs can facilitate community building and strengthen online and offline social ties in developing regions (Ellison, Steinfield, & Lampe, 2007; Hampton & Wellman, 2003; Wellman et al., 2001). For example, feature phones in urban Bangalore have significantly fostered social capital among lower-income groups by enabling a vibrant culture of mobile media sharing (Smyth et al., 2010). Moreover, these accessible and affordable technologies have filled a gap in entertainment alternatives, serving as a platform for communication, knowledge sharing, and community-building. Such developments highlight the potential of pervasive computing and communication technologies to transform millions of lives in the developing world (Parikh, 2009; Parikh, Ghosh, & Chavan, 2003). However, the quality of online interactions should be considered, as they may only sometimes translate into meaningful offline relationships (Williams, 2006). Furthermore, overreliance on technology can lead to decreased face-to-face interactions, potentially undermining social capital (Putnam, 2000). The rise of "networked individualism" (Wellman et al., 2001) facilitated by ICTs may erode traditional community structures, with individuals increasingly relying on personalised, global networks rather than local ones, which may have implications for addressing local issues and fostering community resilience (Toyama, 2015).

2.2.1 ICT in self-help groups

Self-help groups (SHGs) are voluntary, member-based organisations that focus on empowering and improving the socio-economic status of their participants, particularly women and marginalised communities (Alemu, van Kempen, & Ruben, 2018; Nayak & Panigrahi, 2020). ICTs are increasingly being integrated into SHGs to enhance their

effectiveness, offering new opportunities for communication, resource access, and financial management (Parikh, Ghosh, & Chavan, 2003).

ICTs have helped SHGs overcome geographical and social barriers by enabling communication, information exchange, and coordination among group members (Kasera, O'Neill, & Bidwell, 2016). Digital financial management systems, for instance, have been designed to accommodate rural, semi-literate users, ensuring accessibility and inclusivity (Muralidhar et al., 2018; Parikh, Ghosh, & Chavan, 2003). In addition, developing smartphone apps tailored to users with mixed literacies has improved the financial management capabilities of SHGs, as demonstrated by Muralidhar et al. (2018) and Tandon et al. (2019) on contextually appropriate and user-centric design.

However, incorporating ICTs into SHGs also brings potential challenges. For example, the digital divide might worsen existing inequalities within the group. Members with better access to ICTs and the skills to use them effectively could leverage these tools for personal advantage, leaving others behind (Muralidhar, 2019). Additionally, introducing ICTs might inadvertently change the dynamics of SHGs, leading to unintended consequences such as disrupting traditional monetary ecologies (Muralidhar et al., 2018). Thus, it is crucial to consider the socio-economic context and the diverse needs of users when designing and implementing ICT solutions for SHGs (Muralidhar et al., 2018; Tandon et al., 2019).

2.2.2 ICT in stokvels

Using ICTs has become increasingly important in operating stokvels, particularly in developing countries such as South Africa (Egbe & Mutanga, 2016). However, these informal groups often face limited internet access, a shortage of credit card diffusion, and inadequate electricity supply in rural areas (Johnston et al., 2015). Despite these challenges, ICTs may have potential to enhance the functioning of stokvels by providing members with a medium for communication, coordination, time management, and overall interaction (Hart et al., 2015).

Mobile devices are effective tools for ICTs in stokvels due to their versatility (Egbe & Mutanga, 2016). A qualitative approach was used to understand ICT adoption in

stokvels, with members interviewed about their experiences (Johnston et al., 2015). The study found that social networks like WhatsApp and Facebook facilitate social interactions and motivate individuals to join stokvels (Matuku & Kaseke, 2014).

Previously, stokvels' manual and offline operations have made it difficult to ensure transparency and efficient record management. However, there have been efforts from fintech companies to digitise these informal financial institutions, providing mobile applications for record management and automated payment reminders. In addition, some urban stokvels have also reported using spreadsheets for record management and mobile wallets as a cash alternative (Biyela, Tsibolane, & van Belle, 2019).

The digitized records generated by ICTs are also used to credit rate stokvel members for other sources of credit outside of these groups (Mehmood et al., 2019). However, the limitations of these mobile applications include their focus on digitally inclined younger users, which limits their widespread adoption (Tiwari & Gupta, 2020).

2.2.3 Challenges of ICT Adoption

Adopting ICTs in stokvels may pose various challenges. One such challenge is the need for universal coverage in some rural areas, which hampers the implementation of ICT initiatives nationally as suggested by Harrisberg and Mensah (2022). As a result, government incentives may be required to extend network coverage to remote populations where such services can have significant impact. Another challenge is the deployment of a single solution to multiple locales. Meaning that mobile platforms that use specific symbols and/or language may not translate well to another context, particularly for interventions that foster behaviour change through targeted messages (Gurman, Rubin, & Roess, 2012). The timing of communication messages, including the time of day, frequency, and sequencing, should be considered to ensure that information is conveyed at a convenient time when the end user is most receptive (Atun et al., 2006; Gurman, Rubin, & Roess, 2012). Moreover, the use of ICTs in development sectors needs to be improved by the absence of indicators or tools to measure the success of implemented projects. Performance measuring tools must be developed to guide appropriate design, planning, implementation, and monitoring criteria (Rahman, 2007). Additionally, the lack of comparable data, design and

evaluation practices and the prevalence of information silos prevents integration and coordination through mutual learning (Mechael et al., 2010).

The inability of new ICTs to be successfully and effortlessly incorporated into existing information systems remains a challenge, particularly in developed countries (Mechael et al., 2010). High data package costs are suggested to also play a role in the digital divide in Africa, with low-income earners relying on prepaid data services (Stork, Esselaar, & Chair, 2017). Plopper and Conaway (2013) and Takavarasha, Cilliers, and Chinyamurindi (2018) also argue that the lack of digital devices can also be a significant challenge, particularly in South African rural universities, limiting students' engagement with technology in the classroom.

The cost of data is a significant barrier to ICT adoption in developing regions, particularly in Africa. In South Africa, high data costs exacerbate limited access to ICTs, with users paying up to R85.00 ($5.29) per GB of data, equivalent to nearly four hours of work for minimum wage earners, compared to $1.53 per GB in North Africa and $2.47 in Western Europe (Mochiko, 2017; Chinembiri, 2020; Harrisberg & Mensah, 2022). Despite the potential for mobile phones to drive economic growth in underprivileged communities, unequal access and high connectivity rates hinder progress (Phokeer, Johnson, & Densmore, 2016). Cost-conscious users employ various strategies to optimize data usage, such as switching off data until a Wi-Fi network is available, using promotional bundles, relying on USSD platforms, and turning off automatic updates (Mathur et al., 2015).

2.2.4 Factors influencing ICT adoption in stokvels

Several factors influence the adoption of ICTs in stokvels. Firstly, the availability and affordability of technology, such as smartphones and internet access, determine the ability of stokvel members to access and utilise technology-based financial services. In some instances, the lack of access to technology may result in only a few members adopting the use of ICTs, while others may be left behind (Letsie & Kabanda, 2015). Secondly, cultural norms also play a significant role in adopting ICTs in stokvels. Stokvels, an essential part of the cultural fabric of many African communities, have traditionally relied on face-to-face interactions and personal relationships to build trust and manage their financial activities. The shift towards digital financial services,

although seen as a more efficient means of managing financial transactions, may threaten cultural norms and practices. Therefore, for the adoption of ICTs to be successful, it is vital to understand and address any cultural barriers that may exist (Chigona et al., 2010). Lastly, the organisational structure of the stokvel is another factor that can impact the adoption of ICTs in stokvels. The size, structure, and decision-making processes within stokvels may determine the speed and extent of ICT adoption. For instance, smaller stokvels may find it easier to adopt ICTs as they have a more flexible and adaptable organisational structure. Comparatively, larger stokvels may find it more challenging due to their formal and rigid organisational structures (Biyela, Tsibolane, & van Belle, 2019).

In the South African market, several software applications are dedicated to improving the management and administration of stokvels. For instance, StokFella offers a financial management platform with an accompanying app, empowering Stokvel groups to handle and consolidate their financial activities efficiently. Additionally, the platform provides communication and visualisation tools, aiding in the analysis of financial data and related matters. Gooi Gooi, on the other hand, serves as a mobile digital savings platform specifically designed to enhance the functionality of Independent Savings Groups (ISGs) like Stokvels. The app optimises operational efficiency, amplifies savings returns, and promotes financial education among ISG members. Lastly, Stokii, a free mobile app, aims to bring structure and formalisation to various social groups, facilitating improved interaction and administration (StokFella, 2023; Gooi Gooi, 2023; Stokii, 2023). These software applications demonstrate efforts to streamline and enhance stokvel management processes, providing valuable tools to address their unique challenges.

2.2.5 Opportunities for mobile device usage

Mobile phones, as a subset of ICTs, have the potential to serve the development needs of vulnerable populations by offering a widespread and low-cost option for rapid information transfer and service facilitation. This eliminates common issues such as distance and time, making ICTs accessible to many (Hutchings et al., 2012).
A report by mWASH (Mobile Phone Applications for the Water, Sanitation, and Hygiene Sector) published by the Pacific Institute in 2012 provides detailed insights

into the field. Hutchings et al. (2012) emphasize its importance and recommend it as a companion to their report. The Pacific Institute found that project success depends on effective program management, financial and technical sustainability, and monitoring and adaptively managing system effectiveness in the short and long term.

An analysis of past and present ICT projects in the water sector has shown that the success or failure of these projects depends on three key dimensions: social design, technical design, and program design. Social design encompasses the social component of the ICT design, including the social context of implementation, organisational structures, stakeholders, and information sharing. Alternatively, technical design refers to the system's appropriateness and correctness for the problem. Finally, program design focuses on the support structure for the scalability and sustainability of the project (Hutchings et al., 2012).

In financial services, mobile payments, also known as mobile money, have been identified as a solution to increasing consumer revenue collection. Mobile money has proven successful in East Africa, especially in Kenya, enabling quick, efficient, and cost-effective access and funds transfer between previously unbanked parties. In addition, mobile payments have additional consumer benefits, including reducing travel costs to local municipal offices and minimising the time investment required to pay bills, typically during work hours (Foster et al., 2012).

The literature on ICTs and related technologies highlights the need for continuous evaluation and awareness of long- and short-term goals. A review of the available literature illustrates that studies within this domain in the SA context are relatively few, thus compromising the validity of existing pilot projects/ compromising the statistical significance of findings in available pilot studies. Countries have sometimes placed moratoriums on pilot ICT projects in their health sectors including Kenya and South Africa (Hutchings et al., 2012). Despite these challenges, some projects have shown success, demonstrating the benefits of ICT systems when implemented effectively.

2.3 User-centred Design and Usability

2.3.1 User-centred Design in developing regions

User-Centred Design (UCD) is a vital aspect of product development, focusing on enhancing usability, functionality, and overall user experience. This approach puts the user's needs at the heart of design and development. It facilitates the creation of products that are not only functional but also user-friendly and intuitively designed (Shania, Raharjo, & Fitriani, 2023). Applying UCD principles becomes particularly crucial in developing regions, considering the unique needs and contexts of the users (Etta & Parvyn-Wamahiu, 2003). The application of UCD in developing regions, especially concerning mobile users, demands an understanding of the unique contexts of these regions, such as literacy rates, cultural subtleties, and user traits. The small form factor and increasing software complexity of mobile devices present unique challenges to usability (Gafni, 2009). These areas and, in particular, stokvel users, often deal with unique hurdles like lower education levels, higher unemployment, varying income levels, and a sense of unease with technology, which can significantly influence how technology is adopted and used (Ibtasam et al., 2017; Patton et al., 2016). For example, elderly adults may have limited prior experiences with computers and technology and cognitive changes that affect various aspects of their life as they age (Van Welie, van der Veer, & Eliëns, 1999, 1999; Wirtz, Jakobs, & Ziefle, 2009, 2009). Therefore, software designers should design appropriate and more accessible interfaces for this demographic (Demiris et al., 2004). The design process should be user-driven, aiming to foster user confidence and trust, thus contributing to the creation of practical and usable interfaces (Ferre et al., 2001; Johnson, Johnson, & Zhang, 2005; Peleg et al., 2009; Sherwani et al., 2007). The UCD approach can provide a valuable framework for stokvel designers to consider the needs of their target audience (Alyahya & Almughram, 2020).

Moreover, literacy poses a significant challenge in these regions with implications for UCD; simply giving people technology or teaching them how to use ICT tools does not necessarily lead to increased technology usage (Heukelman, 2006). The technology needs a clear purpose, and the community needs to see how it can help them achieve their goals. This emphasises the need for a user-focused approach that accounts for

the specific needs and limitations of the user community. Adoption hurdles of ICT often translate into challenges for implementing UCD strategies. A top-down approach to development often leaves these tools grappling with sustainability, scalability, acceptance, and influence, ultimately affecting their success (Etta & Parvyn-Wamahiu, 2003). The literature proposes that adopting a participatory bottom-up approach, which emphasises community engagement and inclusion of their perspectives, tends to yield improved outcomes (Friedmann, 1992; Smit et al., 2011). Diversity should be at the core while creating ICT solutions for such regions, as cultural differences between urban developers and rural users may lead to a mismatch in values and attitudes (Walsham, 2002). These methods emphasise the inclusion of the target audience in the design process, from the initial stages to the final implementation of the system (Ferre et al., 2001; Johnson, Johnson, & Zhang, 2005; Peleg et al., 2009; Sherwani et al., 2007). Huenerfauth (2002) discussed that additional complexity arises from the lifestyle of community members in these regions, which does not typically align with structured office routines common in more urbanised areas. This discrepancy poses an accessibility challenge, hindering their involvement in design studies. Huenerfauth suggests using hypothetical scenarios in the design process when the target audience is inaccessible to mitigate this issue. This method enables the creation of representative personas, thereby increasing the effectiveness of the design process.

Available literature suggests that many financial service providers adopt a one-size-fits-all approach rather than designing services that cater specifically to the needs of their user base (Grossman, Fitzmaurice, & Attar, 2009). Given the unique challenges faced by low-literate and tech-naive populations, it is essential to approach the design of financial services for these users with a user-centred focus.

2.3.2 User Characteristics in digital informal savings and loan groups

The digital transformation of informal savings and loan groups in South Africa has undergone substantial progression over time, driven by the increased accessibility and affordability of smartphones and cost-effective data packages, which have expanded the reach of internet services to a more diverse population of users (Rumney, 2021).

One of these users' defining characteristics is their significant income allocation to data, primarily motivated by the allure of popular social media platforms such as WhatsApp (Church & deOliveira, 2013). These platforms, blurring the lines between communication and entertainment, have become primary catalysts for mobile Internet usage, stimulating overall adoption (O'Neill et al., 2014).

Within this user group, there is a notable evolution in user behaviours and technology usage patterns, with feature phone users being primarily replaced by smartphone users, among whom Android has emerged as the prevailing preference (Statista, 2023). Notably, women participating in informal savings groups demonstrate an ability to comprehend numerical figures despite varying literacy levels, as non-literate individuals have shown proficiency in interpreting numerical digits (Parikh, Ghosh, & Chavan, 2003; Ratan et al., 2010). This phenomenon is observed globally, with semi-literate women in Tanzania engaging with digital bookkeeping through smartphones (Arnold, 2020; Asmar, van Audenhove, & Mariën, 2020).

From the perspective of this user group, technology adaptation appears as an ongoing and dynamic process, aligning with the theory of domestication (Berker et al., 2006; Hynes & Richardson, 2009; Silverstone, Hirsch, & Morley, 1992). WhatsApp serves as a prime example of a technology that has been "domesticated" and tailored to the needs and habits of its user base, reflecting its flexibility and adaptability in the digital world (Berker et al., 2006). However, literacy remains a significant hurdle, as evidenced by research in Tanzania, where women exhibit hesitation and challenges when interacting with smartphone technology, indicating that increased usage does not automatically overcome literacy barriers (Arnold, 2020).

The role of immediate family and close friends is crucial in facilitating the adoption and use of technology, especially within ICT, particularly in cases where primary device owners lack the necessary literacy skills (Eynon & Helsper, 2015). Material support in the form of access to ICT devices and the internet is often provided within households where these resources are available, and close associates may serve as intermediaries to handle digital tasks on behalf of less tech-savvy individuals, providing practical help and reducing the associated stress and anxiety (Asmar, van Audenhove, & Mariën, 2020). Family support becomes even more critical for older individuals who

may face initial apprehension or difficulties when introduced to new technologies, as intergenerational learning allows for a smoother transition and adaptation to ICT solutions (Bencivenga, 2017; Cáceres & Chaparro, 2017; Eynon & Helsper, 2015; Tatnall, 2014). These observations emphasise the need for digital financial solutions to consider partial literacies, as increasing usage does not necessarily indicate proficiency or comfortability, especially in populations with varying literacy levels (O'Neill et al., 2014). Therefore, the design and development of digital financial solutions should align with literacy initiatives to ensure these platforms' inclusive and effective utilisation. This ensures the growing digital landscape supports and accommodates users with diverse literacy levels.

2.3.2 Design and Prototyping in developing regions

In the realm of Human-Computer Interaction (HCI), designing and prototyping mobile ICT solutions for informal and savings groups in developing countries or rural regions necessitates a user-centred approach to create effective and user-friendly interfaces. Recognising user perspectives and needs in HCI is crucial, as evidenced by foundational studies that propose frameworks and guidelines addressing these considerations (Anckar & D'Incau, 2002; Clarke, 2001). At the core of this user-centric process is the practice of requirement gathering or need-finding (Norman, 1988), the purpose of which is to ascertain what users need or want from a system. Faste (1987) emphasised that identifying a genuine need is a cornerstone of successful product design, influencing the design process and defining the criteria for evaluating success or failure. Nevertheless, gaining insight into user needs can prove challenging, as it requires designers to perceive and recognise the needs of others accurately. Sanders (1992) observes that people may need to explicitly or accurately express their needs, necessitating designers to remain receptive and attuned throughout the user information-gathering process.

In the context of designing mobile ICT solutions for members of digital informal savings and loan groups in developing countries or rural regions, several unique challenges arise. Sheikh, Dar, and Sheikh (2014) highlights that the most challenging aspect of gathering requirements lies not in documenting user needs but in helping users identify their requirements within the project's cost and schedule constraints. Usability barriers

these populations face further hinder their full engagement and reflection of preferences during the design process. Medhi et al. (2011) observe that existing financial service instructions often overwhelm users with text, primarily in English, rendering them unhelpful for non-literate users who need help comprehending accompanying visuals or comprehending convoluted explanations in local languages due to financial jargon. To ensure a practical design and prototyping approach, it is essential to align it with the unique characteristics of users in these regions, considering challenges such as low literacy levels, limited digital technology experience, and language barriers (Brown & Grinter, 2016). Addressing these factors is crucial to create interfaces that are accessible, intuitive, and tailored to the specific needs of these user groups. Additionally, the reliance on hierarchical information architectures in traditional computing software presents difficulties for low-literacy users in navigation and comprehension (Jones & Marsden, 2005; Medhi, Lakshmanan, et al., 2013; Medhi, Toyama, et al., 2013), as these hierarchies have been found to be challenging to use, especially for low-literate users (Parush & Yuviler-Gavish, 2004).

Recognising these issues, research efforts have been initiated to cater to the unique needs of low-literacy users. These initiatives range from studies assessing mobile hierarchical user interfaces (Medhi, Lakshmanan, et al., 2013; Medhi, Toyama, et al., 2013), exploring non-textual information sharing in low-literacy contexts (Medhi, Sagar, & Toyama, 2006) to the design of icon and colour-based phonebooks (Joshi et al., 2008). To effectively design mobile ICT solutions for low-literacy users in resource-constrained areas, it is recommended to incorporate extensive graphics instead of text, as visual cues have proven to be more effective (Grisedale, Graves, & Grünsteidl, 1997; Medhi, Prasad, & Toyama, 2007; Parikh, Ghosh, & Chavan, 2003). Additionally, interfaces should prioritise using numerical digits, which users generally understand well, while minimising scrolling and complex hierarchies to enhance usability (Medhi et al., 2011; Medhi, Toyama, et al., 2013; Ratan et al., 2010). In resource-constrained areas, intermediation through digital or print-literate community members can provide valuable assistance in the user-centred design (UCD) process (Medhi-Thies et al., 2015; Sambasivan et al., 2010).

The usability of mobile payment services among non-literate and semi-literate users is a critical consideration for ICT solutions, as evidenced by studies across India, Kenya, the Philippines, and South Africa. These investigations highlight the unique challenges and requirements of such user groups, emphasizing the importance of designing technology that is accessible and intuitive for all literacy levels (Medhi, Gautama, & Toyama, 2009). The researchers offered several design recommendations, including graphical cues, voice annotation, local language support, minimised hierarchical structures, non-numeric text input, and avoiding scrolling menus. However, it is important to consider that non-literate populations may avoid complex functions and primarily use phones for synchronous voice communication (Chipchase, 2005). This understanding is crucial for tailoring HCI design principles to diverse user bases' unique needs and limitations, ultimately enhancing usability and inclusivity in mobile technologies. By applying user-centred design and prototyping methods aligned with the characteristics of users in informal and savings groups, mobile ICT solutions can be designed to enhance usability and accessibility in developing countries or rural regions.

2.3.4 Assessment of Usability

Usability is a critical concept that originated in the 1980s, essentially substituting the phrase "user-friendly" (Bevan, 2009). The concept was elaborated by Jakob Nielsen, who presented a comprehensive framework, identifying usability as a measure of a system's functionality from the user's perspective. Nielsen's framework encompasses five distinct attributes, including learnability, efficiency, memorability, error occurrence, and user satisfaction, thus presenting a multidimensional approach to assessing usability (Nielsen, 1993).

Usability assessment in these regions presents several challenges. One primary challenge is the adaptation and customization of existing usability assessment methods to suit the specific needs of these regions. Traditional methods often assume certain literacy levels, technical proficiency, and familiarity with technology, which may not be applicable in developing regions. To overcome this challenge, it is crucial to modify these methods, considering factors such as low literacy levels, limited technical knowledge, and the unique cultural context of the target users (Li, 2017). By doing so,

usability assessments can effectively capture the perspectives and experiences of users in these regions, ensuring the relevance and effectiveness of technology solutions. Cultural and linguistic aspects also play a vital role in usability assessment in developing regions. Designers must be sensitive to the target user population's cultural norms, values, and preferences to create technology that resonates with their needs and aspirations (Andreasen et al., 2007). Overcoming language barriers, incorporating local dialects, and ensuring cultural appropriateness and sensitivity in the design are essential considerations. By embracing the local culture and incorporating familiar symbols, metaphors, and design elements, usability can be enhanced, leading to better user engagement and acceptance. Moreover, the lack of support for specific use-case implementation in existing software often necessitates additional customization through third-party applications (Edwards et al., 2008; Li, 2019). This highlights the importance of flexibility and adaptability in usability assessment and design processes to effectively meet the unique requirements of developing regions.

Differences in ethnicity, age, and sociodemographic characteristics between researchers and the communities they work with often give rise to various challenges in usability assessment. These challenges encompass social intimidation, low self-esteem, participant response bias, communication barriers due to language and cultural differences, and social and peer pressure (Anokwa et al., 2009; Dell et al., 2012; Medhi-Thies et al., 2015; Orne, 1962; Squires, 2009). Additionally, the power dynamics between researchers and participants, mainly when there are differences in social status, can significantly influence participant responses and behaviour (Medhi, Cutrell, & Toyama, 2010). To address these challenges and ensure a comprehensive usability assessment in developing regions, involving local stakeholders and communities in the evaluation process is crucial. By actively engaging with community leaders, representatives, and end-users, researchers and practitioners gain valuable insights into the target user population's specific needs, expectations, and preferences. This participatory approach fosters a sense of ownership among the local communities and empowers them to actively shape the design and evaluation process (Li, 2017). By recognizing the importance of local knowledge and perspectives, researchers can overcome the inherent disparities and power imbalances, leading to more inclusive and culturally relevant usability assessments in developing regions.

Despite the challenges, emerging trends and advancements in usability assessment for developing regions exist. Researchers are exploring innovative methods such as conducting usability studies in participants' familiar environments, using non-traditional metrics to measure success, and employing flexible training approaches to cater to diverse user groups (Dell et al., 2012). The need to reevaluate standard best practices and redefine variables used to measure success in usability testing for oral, rural users is crucial. Variables such as memory retention and training methods are proposed to better understand user learning and product usability, emphasizing the importance of tailored approaches for these specific user groups (Gorman et al., 2011). Localizing usability studies to suit each unique context is crucial, involving local staff as primary drivers and adopting flexible and opportunistic approaches that best adapt to the local setting. By incorporating these insights into usability assessment, researchers can enhance the relevance and effectiveness of design interventions in developing regions.

2.4 Summary of literature review

The literature review provides a comprehensive examination of stokvels, detailing their historical context, structural characteristics, and pivotal role in economic empowerment and social capital formation within South Africa. It explores the integration of ICTs into stokvel management, highlighting both the potential benefits and the challenges faced. Benefits identified include enhanced transparency, efficiency, and improved record-keeping capabilities. However, significant barriers such as low literacy levels, limited technology access, and cultural norms are also discussed. Additionally, the review emphasizes the importance of user-centered design and usability, particularly in developing regions, where the unique needs of low-literacy users present distinct challenges. Despite existing research on ICT adoption in stokvels and developing regions, notable gaps remain. Specifically, there is a limited understanding of the impact of digital tools on the traditional dynamics of stokvels, the specific usability challenges faced by stokvel members, and the influence of ICT on social capital formation. This study aims to address these gaps by investigating the use of a mobile application tailored to stokvel members in rural South Africa, focusing on usability and the enhancement of social capital through digital integration.

Chapter 3: Research Methodology

This chapter presents the research methodology employed in this study, which aims to investigate the user experience and usability of a mobile application for stokvel management in rural South Africa, focusing on a village in the Eastern Cape Province (see Figure 3.1). Adopting an interpretivist philosophy and an inductive approach to theory, a combination of qualitative and quantitative research design was utilized to provide an in-depth understanding of the participants' perspectives and experiences. Furthermore, the user-centred design strategy throughout the process emphasizes the importance of catering to stokvel members' unique needs and preferences. The study's primary objectives are to gather valuable insights into designing and developing a practical stokvel management application tailored to the target users' requirements. The methodology involved several stages: gathering user requirements, creating artefacts for initial usability testing, and evaluating a high-fidelity prototype. Additionally, this chapter addresses the study's time horizon, data collection procedure (including sampling and instrument design), data analysis procedure, and ethical considerations. Collectively, these components provide a comprehensive overview of the methodological framework that has been meticulously designed to ensure the study's rigour, validity, and reliability.

Figure 3.1: South Africa (Source: Adapted from Wikimedia Commons, 2023)

3.1 Research Design

The typical Stokvel in the Eastern Cape comprises multiple community members and a chairperson who oversees all group activities. This study employed a combination of quantitative and qualitative research design to examine and understand the operations of such groups and evaluate the potential for developing a mobile application to facilitate their management (Venkatesh et al., 2013). An interpretive approach, combined with a user-centred design methodology, was utilised to enable researchers to delve into Stokvel members' specific needs, expectations, and preferences (Klein & Myers, 1999). Given that the interpretive approach emphasises the importance of context and participants' subjective experiences, it is well-suited for examining how the mobile application interface might influence social capital within Stokvel groups. Moreover, the flexibility of a qualitative, interpretive approach permits an iterative process of design, evaluation, and refinement, which can help ensure that the mobile application interface is tailored to the requirements and preferences of Stokvel members. This study was conducted through various stages, including focus group discussions in one session, prototype development done separately after the focus group, and usability testing in a separate session, allowing for capturing the nuances of social interactions and relationships within the Stokvel context (Nili et al., 2017). These stages provided valuable insights into the mobile application's effectiveness and usability, identifying potential areas for improvement. Due to time and resource constraints, this study adopted a cross-sectional timeframe for data collection. Furthermore, employing a cross-sectional design enables the capture of a snapshot of participants' experiences and the mobile application's impact at a specific time. Although this approach provides valuable insights, it is essential to acknowledge the study's limitations, such as its inability to capture changes in user experiences and the mobile application's impact over an extended period.

3.2 Participants and Sampling

To thoroughly understand users' needs and expectations related to stokvels and their operations within a rural context, a focus group was conducted with participants knowledgeable about the subject matter. This approach facilitated guided discussions and allowed participants to share their perspectives, experiences, and challenges,

providing valuable insights into their needs and expectations for developing a mobile application. To recruit participants from rural areas actively involved in a stokvel, the study collaborated with the Imijelo Yoophuliso Foundation, an NGO that empowers community members through education and supports the establishment of stokvels. The foundation operates in the Eastern Cape and manages multiple stokvel groups in the region, making it well-positioned to help identify suitable participants.

A total of 13 participants were recruited for the study, with five participating in the focus group and eight taking part in the usability testing after the prototype was developed. The participants selected for the Focus group were all members of one stokvel group. However, the usability testing participants were not all members of one stokvel group. The study employed purposive sampling to select focus group participants, as this method enables the selection of individuals with the necessary knowledge, experience, and characteristics relevant to the research objectives (Palinkas et al., 2015). However, convenience sampling was used for the usability testing due to the limited time and resources available for data collection (Marshall, 1996). In addition, the convenience sampling approach allowed the research team to select participants who were available during the data collection period and met the criteria of being a member of a stokvel group in the Eastern Cape. This sampling method was chosen because it is time-efficient and cost-effective while allowing the researcher to access a diverse range of participants with varying experiences in the context of stokvels.

3.2.1 Focus Group Participants & Setting

The focus group consisted of participants from a single stokvel group, operating for approximately two years from Mchewula village. This decision was made to facilitate the on-site focus group in the Eastern Cape, as it was more logistically feasible to gather participants from the same group. This stokvel group was chosen due to its active community involvement and diverse representation of socio-economic backgrounds and age groups characteristic of the rural Eastern Cape population. The focus group comprised four regular members and one female chairperson, reflecting the gender distribution commonly observed in South African stokvel groups (Bophela & Khumalo, 2019). Participants' ages ranged from 25 to 60 years, with varying levels

of formal education and experience using mobile applications. This diversity allowed for collecting insights from different perspectives and preferences regarding usability and user experience.

The familiar focus group setting, with participants from the same stokvel group who knew each other, facilitated more natural interactions and honest discussions about their experiences. This was crucial for the study, as the product under development focused on their interactions and group dynamics. The sample size of five participants for the focus group is considered appropriate for this study's qualitative, interpretivist approach, as it prioritises depth of understanding over generalizability (Creswell, 2013). Smaller sample sizes are suitable for in-depth, qualitative investigations in HCI (Courage & Baxter, 2005). Although the sample size may limit the generalizability of the findings, it allows for a detailed exploration of the participants' experiences and perspectives, which is essential for achieving the research objectives.

3.2.2 Usability Testing Participants

The selection process for this study was deliberately designed to cater to those who could be more skilled with technology, mirroring the usual participants of a developmental scheme. Those coming from lower socio-economic backgrounds were sought out, with a limited household income and access to high-tech ICTs restricted to mobile phones. Thus, individuals selected for the 'users' group did not own a personal computer but were required to own a multimedia-enabled mobile device. Our strategy also made sure that a reasonable representation of women was included. Following this:

The foundation pinpointed individuals to partake in the usability testing session based on their availability, consisting of six women and two men. The researchers clarified to the foundation that any expenses participants incurred due to testing would be compensated. The usability testing participants ranged from 22 to 60 years old, with varied educational backgrounds and professions. Each participant had access to a mobile device and a basic comprehension of English. They were requested to perform tasks utilising the prototype mobile application. Remote usability testing sessions were

carried out, and session data was collected to assess the user experience with the prototype.

Participant ID	Age	Gender
0001	53	Female
0002	34	Female
0003	23	Female
0004	22	Female
0005	34	Male
0006	44	Female
0007	27	Female
0008	25	Male

Table 3.1: Participant's composition

The researcher mandated that usability testing session participants should be proficient in basic English due to the inability to translate the prototype into isiXhosa or other local languages owing to resource constraints and considering that English is widely understood and spoken in South Africa, acting as a lingua franca (Khokhlova, 2015). This decision implies that the study results might only be somewhat generalisable for individuals with limited English skills. Hence, it is crucial to acknowledge that language barriers affect the application's usability and may not accurately depict the experiences and preferences of all potential users in the Eastern Cape. Future research could explore other sampling methods like purposive or stratified sampling to ensure a more diverse and representative sample to counteract potential biases and limitations arising from the sampling methodology and language

requirements. Furthermore, supporting local languages like isiXhosa in future application versions could enhance its accessibility and acceptance by a broader user base.

3.3 Ethical Consideration

The ethical considerations associated with designing and testing a mobile application prototype in rural areas encompass more than obtaining ethical approval and gaining access to participants. Researchers are cautioned by Silverman (2016) to note that when they move into the participants' environment to conduct their research, they enter the participants' private space. Entering into the community space brings about several ethical issues that should be considered, such as obtaining consent, handling potential risks of harm, ensuring honesty, trust, privacy, confidentiality, and anonymity, and promoting voluntary participation (Miles & Huberman, 2016). As responsible researchers, we recognised the importance of understanding the participants' context and their identities within that context. This understanding was crucial in informing our research design approach and ensuring our interactions with the participants were culturally sensitive and respectful. To navigate these ethical considerations, we established a close collaboration with our partnering organisation, Imijelo, which played a crucial role in guiding us through the entire research process, including usability sessions and focus groups. This collaboration allowed us to align our activities with the cultural and social norms of the community, providing invaluable guidance and ensuring appropriate and respectful interactions.

3.3.1 Focus Group Ethical Considerations

To ensure ethical standards were maintained during the focus group sessions, a series of steps were taken in collaboration with Imijelo, our partnering organisation. We were fortunate to learn from Imijelo that the Stokvel community was familiar with research sessions, having participated in similar workshops before. This prior experience made the process more accessible and facilitated communication. We initiated the process by sending a formal request to Imijelo, providing comprehensive details about the research project, including the aim of the focus group, the purpose of the data collection, and the methodology we planned to follow. Imijelo, experienced in organising research workshops within the community, efficiently facilitated

communication with the Stokvel members. They engaged with the community, inquiring about their availability to participate in the focus group sessions. The Stokvel chairperson reviewed our request, granted approval, and suggested conducting the focus group on the same day as their monthly Stokvel meetings to ensure maximum participation and convenience for the attendees.

Additionally, we prepared and submitted an ethics approval application to the Commerce Faculty Research Ethics Committee at the University of Cape Town, adhering to the university's ethical regulations. This was subsequently approved with evidence shown in Appendix 7.1. This step ensured the participants' transparency, oversight, and protection throughout the research process. As a gesture of gratitude for their contributions and time, financial compensation was provided to the participants, contributing to their Stokvel fund. Throughout the entire process, ethical considerations were communicated to the participants. They were informed about using pseudonyms to maintain anonymity and removing any personal information from the transcripts to protect their privacy. Participants were reassured that their participation was voluntary and that they could withdraw from the study at any point without facing negative consequences. Additionally, language barriers were addressed, with participants being informed that the focus group sessions would be conducted in English and that translation assistance would be available if required. Open communication was maintained, and participants were assured they would be informed about the research outcomes, fostering transparency and reciprocity. By following these steps, we aimed to uphold ethical standards, respect the rights and well-being of the participants, and create a supportive and inclusive research environment during the focus group sessions.

3.3.2 Usability Testing Ethical Considerations

In preparation for usability testing, close collaboration and continuous consultation with Imijelo played a crucial role in recruiting and obtaining approval to interact with community members and aligning the research activities with their cultural and social norms. The process began by reaching out to potential usability testing participants through the chairperson of Imijelo. The chairperson informed them about the study and provided all the necessary details, similar to the approach taken with the focus

group participants. This initial communication ensured participants were well-informed about the study and its objectives.

Once an individual expressed interest in participating, a phone call was made prior to commencing the usability testing. During this call, the purpose of the study was further explained, any questions or concerns were addressed, and their willingness to participate was confirmed. This phone call served as an additional step to ensure that participants fully understood the nature of the study and voluntarily agreed to take part.

When the usability testing phase began, informed consent was required from participants through the prototype itself. Clear instructions were provided within the application, outlining the purpose of the testing, the data that would be collected, and the participants' rights and options throughout the process. Participants were asked to actively provide consent within the prototype before proceeding with the testing. This ensured that participants clearly understood their involvement and could provide informed consent directly within the research context. These ethical considerations, including direct communication and individual consent, were implemented to protect the participants' rights and autonomy throughout the usability testing process. By incorporating these measures, we aimed to create an environment that respected participants' choices and ensured their informed participation.

3.4 Data Collection

3.4.1 Focus Group Session

The primary objective of a focus group is to obtain insights and understanding from representatives of the target audience who would use the mobile application for managing their Stokvel (Cronin, 2008). These insights would represent the requirements we would need to develop the prototype. In addition, focus groups facilitate the exchange and clarification of ideas and issues, enabling participants to collectively reach a consensus on their requirements. Instead of surveys and interviews, focus groups can yield richer and more in-depth information by allowing interaction between the moderator and participants and among participants themselves (Lederman, 1990). This method allows target population members to express their ideas spontaneously without being constrained by the researchers'

biases (Bertrand, Brown, & Ward, 1992). Moreover, focus groups ensure the active participation of members in the design process, allowing them to voice concerns and express their preferences for the mobile application (Rogers, Preece, & Sharp, 2011).

The process stages of the focus group utilised in this study include planning, recruiting, moderating, analysing and reporting (Gibbs, 1997). During the planning stage, the researcher familiarised themselves with the focus group technique and identified key factors to be discussed in the session based on the literature. The focus group session was scheduled to coincide with the group's monthly meeting, ensuring member attendance. The session occurred at the customary meeting location, allowing participants to feel comfortable in a familiar environment. The foundation notified all participants a month in advance for the researchers to make the necessary travel arrangements to the Eastern Cape. As the foundation often hosts researchers at these sessions to learn more about the organisation, participants were familiar with external parties conducting research during their meetings. The pre-planned approach for initiating group discussion included (1) welcome, (2) topic overview, (3) ground rules, (4) verbal consent, and (5) first question. The foundation was informed that the session would last approximately 1 to 2 hours. The researcher, acting as the moderator, was accompanied by the foundation's chairperson, who also served as a translator during the session, as isiXhosa is the predominant language in these meetings. The moderator's role was to clearly articulate the session's purpose and expectations, facilitate interaction by outlining discussion topics, and control the conversation's direction (Gibbs, 1997).

Upon arrival, the chairperson introduced the researcher, explained the purpose of their presence, and provided details on how the study's results would be used and why the participants were selected (Morgan, 1997). The participants were informed that the session would be recorded using a voice recorder, with the audio stored for further analysis. However, the members indicated they could only allocate one hour for the research, necessitating focusing on the session's critical aspects. Due to low literacy levels and time constraints, researchers obtained verbal informed consent from the members before proceeding (Guillemin & Gillam, 2004). The participants agreed, and the recording commenced. The researcher spoke each sentence in English and translated it into isiXhosa by the organisation's chairperson. Discussions continued

until all topics seemed thoroughly explored. Open-ended questions were asked, guided by the list in Appendix 7.2. These were designed to probe deeper into participants' motivations for their responses. The questions were initially written in English and eventually translated into isiXhosa so the chairperson could easily translate what was being asked in real time. The semi-structured focus group format allowed for guided conversation, ensuring all essential aspects of understanding participants' needs and expectations were covered.

The research team asked the participants a series of questions organised into three main sections: Stokvel-specific questions, Social Capital questions, and Design preferences or technology use questions. In the first section, the research team inquired about the participants' demographics and experiences related to their involvement in stokvels. The questions addressed membership duration, reasons for joining, and preferences for information updates on stokvel activities. The research team also sought to understand participants' challenges in staying informed about stokvel activities, particularly during the COVID-19 lockdowns. Additionally, the team asked about the participants' communication preferences for requesting loans and being informed about their stokvel balances. In the second section, the research team focused on social capital within the stokvel groups. The team asked about the participants' interactions with other Stokvel members, the impact of Stokvel membership on their lives, and the development of friendships and trust within the group.

Moreover, the participants were asked about instances where they provided or received non-monetary assistance from fellow stokvel members. In the third and final section, the research team investigated the participants' current mobile device usage, preferred mobile applications, and any difficulties encountered with those apps. Furthermore, the participants were questioned about their expectations regarding the artefact's design and its significance to the group. Throughout the focus group session, the research team encouraged participants to share their experiences, preferences, and insights regarding stokvels, social capital, and technology usage. The data collected aimed to inform the design and development of a mobile application prototype tailored to the unique needs and preferences of rural South African stokvel members.

At the session's conclusion, the researcher expressed gratitude to the members and informed them of a potential follow-up usability session, inviting interested participants to join. The participants could indicate their interest through the chairperson, who would help facilitate the usability session. To show appreciation for their time and involvement in the focus group, the participants were informed that ZAR 500 would be sent to the stokvel as a contribution. This amount would be distributed through eWallet services to a chosen phone number. The recording was uploaded in WAV format to a Microsoft Teams folder, serving as the basis for transcription. A third party translated the transcript, primarily in isiXhosa, into English, which was later used for analysis (Krueger & Casey, 2014).

3.4.2 Prototype Development

In the prototype development phase, the focus group data analysis results were leveraged to identify the key requirements of the target users. User stories were employed to communicate these requirements and effectively facilitate collaboration among various stakeholders (Lucassen et al., 2016). User stories concisely represent users' needs, goals, and expectations, ensuring that the design and development process remains user-centred (Cohn, 2004).

Derived from the focus group data, these user stories offer valuable insights into users' motivations, context, and desired outcomes, guiding design decisions and promoting an iterative development approach (Martin & Martin, 2006). By doing so, they help create solutions that align with users' requirements and expectations. Furthermore, user stories support measuring the success of the developed product, system, or service (Beyer & Holtzblatt, 1998). By utilising user stories to represent the requirements gathered from the focus group, the prototype development process ensured that the resulting solutions effectively addressed the needs and expectations of the target users. Furthermore, this approach promotes collaboration, fosters shared understanding and drive the creation of user-centred solutions that are more likely to be embraced by the target audience (Beyer & Holtzblatt, 1998). Thus, integrating user stories derived from the focus group data plays a critical role in ensuring the successful

development and implementation of the mobile application for managing Stokvels. The user stories were represented using the following format:

As a [role], I want to [action], so that [benefit/outcome].

Role: This element identifies the user or stakeholder engagement in action.
 Action: This component outlines the particular functionality or feature the user desires.
 Benefit/Outcome: This aspect highlights the advantages or results the user anticipates from executing the action.

This structure ensures a clear and concise representation of user stories, allowing for effective communication of user requirements throughout the research. After developing the group of user stories, the next step would be to create a low-fidelity prototype. Based on the analysis outcome, this prototype would be used to obtain feedback and determine the most appropriate artefact (Dumas & Redish, 1999). The low-fidelity prototype would be used for a formative evaluation with four users, and iterations would be made after each usability session. Once the feedback was gathered, the high-fidelity prototype was developed and tested with the final four participants in a summative evaluation (Nielsen, 1993).

To ensure that our prototype design adheres to well-established usability standards, we adopted and applied the ten usability design principles defined by Jordan (1998). The constraints of our ongoing project guided the selection and application of these principles. Here, we outline how these selected principles were utilised to optimise our prototype's usability.

1. **Consistency:** Similar tasks should be executed similarly.

2. **Compatibility:** The product should align with user expectations based on prior experience with similar products.

3. **Feedback:** The application should provide user feedback at all interactions.

4. **Visual Clarity:** Our end users possess a wide range of digital proficiency and literacy levels, so presenting information clearly and easily was crucial.

5. **Error Prevention and Recovery:** Minimise potential error occurrence and facilitate easy recovery.

These principles were aligned with Google's Material Design principles, considering the Android operating system's dominance in South Africa. Material Design focuses on user-graphical interface interaction, incorporating elements such as elevation, motion colour, shadow colour balance, and more to ensure an intuitive and appealing user interface (Google Material Design, n.d.).

1. **Metaphor of Material:** Our design reflects real-world affordances, allowing users to relate to the interface easily.

2. **Bold, Graphic and Intentional:** The design adheres to print design principles, with typography instantly reflecting hierarchy and meaning.

3. **Use of Motion:** The interface provides immediate and continuous feedback to user actions, ensuring subtle feedback is given.

Applying these usability principles from Jordan P.W. and Google's Material Design is justified by their universality and effectiveness in creating user-friendly designs. By considering the nuances of our end-users, their varying levels of digital literacy, and aligning the design to their expectations and experiences, we enhance the likelihood of a successful and intuitive prototype. Through iterative testing and feedback, these principles provide a robust method for refining and enhancing our application's design.

The design process for the mobile application prioritises usability and accessibility, considering device compatibility and potential internet connectivity limitations of users in the region (Lazar, Feng, & Hochheiser, 2017). The application was also designed considering users' language fluency, featuring clear and user-friendly features to ensure inclusivity for those with low literacy levels (Constantinides, 2004). However, the approach to interface design, usability testing, and evaluations ultimately depended on the outcome of the data analysis.

3.4.3 Usability Testing

This study's primary objective of usability testing is to determine the usability of a mobile application interface for members of stokvels in rural communities. This

involves examining how a typical Stokvel member interacts with the application while performing tasks commonly associated with Stokvel activities. According to Shneiderman and Plaisant (2010), the primary purpose of usability tests is to identify issues that may hinder the user experience. Nielsen (2012) argues that an artefact is considered usable if it meets the following five criteria:

1. **Learnability:** The ease with which a user can complete basic tasks during the initial interaction with a system.

2. **Efficiency:** The speed at which a user can perform tasks after becoming familiar with the system.

3. **Memorability:** The ease with which a user can regain proficiency in using a system after a period of disuse.

4. **Errors:** The number and severity of errors a user makes and their ability to recover from these errors.

5. **Satisfaction:** The satisfaction users experience while using the design.

The data for this study was collected and analysed through custom exercises designed to pinpoint interface elements or behaviours that may bewilder the members of Stokvel, potentially hindering them from completing tasks or achieving the five usability factors. The conception of these exercises and the data collection methodology largely hinge on the requirements extracted from the focus group data. Given the research emphasis on populations with low literacy and minimal tech experience, formulating a usability testing procedure that corresponds to the target audience's specific needs and preferences is vital.

In the context of usability tests, they can either be conducted within a controlled, laboratory-style environment where the real-time performance of the prototype is measured or in an environment that the user is familiar with. For this research, the latter was implemented, essentially permitting participants to be in their comfort zones while interacting with the test artefact. This approach predominantly centred around the functionality and behaviour of the artefact rather than strictly its performance (Nielsen, 2012). This decision was driven by two main considerations. The first was the practical constraints of conducting tests remotely, especially within rural settings,

due to time limitations, geographical challenges, and the complexity of involving multiple individuals dispersed across rural areas. The second was resource limitations, which dictated the feasibility of adopting a more flexible and participant-oriented testing approach, ensuring the process was as accommodating as possible to the individuals involved.

3.4.3.1 Remote usability testing

In this study, we adopted the remote synchronous usability testing approach to evaluate the system's usability, considering our limitations in terms of resources for travel and the specific methodology we are employing, namely the Wizard of Oz technique. Remote usability testing involves conducting tests with participants physically separated from the test moderators. Andreasen et al. (2007) describe two main approaches to remote usability testing: synchronous and asynchronous. Remote synchronous testing refers to live user testing where the test moderator and test subject are geographically separated. This approach allows for real-time interaction and observation of the participant's performance. In contrast, remote asynchronous testing involves the test moderator and subject being separated in space and time. In this case, the test subject completes tasks and records their performance, which is later reviewed.

By conducting remote usability testing, we also overcome the limitations of having a homogeneous subject pool, as it enables us to involve a more diverse array of users without the need for travel. This approach saves time and reduces logistical challenges associated with coordinating in-person testing sessions. Furthermore, existing literature suggests no significant difference between remote synchronous and laboratory testing in identifying usability problems when the test process is well-planned (Huang et al., 2009). However, remote asynchronous testing is generally less effective in identifying problems than other methods (Thompson, Rozanski, & Haake, 2004). To conduct remote synchronous usability testing, we will employ specific tools that facilitate real-time interaction and data collection. These may include video conferencing applications or remote application-sharing tools that allow the test moderator to observe the participant's screen and interactions (Dray & Siegel, 2004; Thompson, Rozanski, & Haake, 2004). This tool will depend highly on the approach

chosen to prototype based on the application functionality. The chosen approach aligns with our objectives, considering the nature of our thesis and the need to capture qualitative data during the testing process.

We have referred to recommendations provided by Thompson, Rozanski, and Haake (2004) to ensure high-quality remote usability tests. They emphasise the importance of synchronous testing with a test evaluator, enabling methods such as the thinking aloud technique, user feedback, and real-time debriefing. Our chosen method of communication for these interactions will be through a preferred text messaging tool, which allows for seamless instructions and communication during the testing sessions.

3.4.3.2 Wizard of Oz Method

The Wizard of Oz (WoZ) methodology, first coined by John F. Kelly in 1980, is a significant tool for evaluating and prototyping user interfaces and systems in the field of HCI (Kelley, 1984; B. Martin & Hanington, 2012). Specifically, the WoZ method enables researchers to simulate an unimplemented or partially implemented application, allowing participants to interact with a seemingly autonomous system. The technique involves a human operator, the 'wizard', who manipulates the system to create the illusion of automation. The WoZ methodology is particularly advantageous when exploring innovative, difficult-to-build interfaces and complex systems. Given its ability to be adjusted and modified in response to user interactions, it is a potent tool in environments with low literacy rates, such as developing regions. This adaptability permits the incorporation of context-specific cues and localised user interfaces, subsequently facilitating more intuitive and user-friendly interactions (Dahlbäck, Jönsson, & Ahrenberg, 1993).

The implementation of the WoZ technique requires meticulous planning and precision. A critical aspect of the process is data collection, which in the research will be primarily facilitated by capturing screen interactions and collecting behaviour logs (Martin & Hanington, 2012). However, the nature of this data collection is highly contingent upon the outcomes of the initial prototyping phase based on the requirements gathered. As such, it is essential to maintain a degree of flexibility in the methodology to adapt to potential changes or revelations from the requirements (Nielsen, 2012). Despite

certain criticisms, such as potential ethical issues related to deception, or concerns about the ecological validity of data collected in a controlled environment, the WoZ technique's benefits in the formative stages of design, particularly when testing novel concepts before implementation, are substantial (Eklund, 2010; Wirén et al., 2007). Carefully addressing these ethical considerations and ensuring the accurate representation of end-users in the studies will enhance the effectiveness and validity of the WoZ-based usability testing. Participants will be fully briefed that the application is a simulation of a real-world application, and there will be no consequence for their participation.

An initial formative evaluation was conducted with four participants using a low-fidelity prototype to identify design issues early in the process. Each evaluation was carried out individually, with the low-fidelity prototype adjusted after each iteration to ensure it meets the high-level requirements identified in the analysis section. After the formative evaluation, four participants participated in individual summative evaluation sessions using a high-fidelity prototype.

Each participant's session followed this structure:

1. The participant was introduced to the study and briefed on its purpose and role. Informed consent was obtained within the usability test to confirm participant agreement.

2. Participants were asked to identify their Stokvel membership role (e.g., ordinary member, chairperson, or executive committee).

3. Participants were instructed to perform a series of tasks provided sequentially.

4. Throughout the session, participants maintained continuous contact via a text messaging platform.

5. Task instructions were shared on the text messaging platform. Participants were also asked interview-style questions about their tasks, ensuring an understanding of the process and allowing performance measurement.

6. Performance metrics include ease of task completion, error rates, requests for clarification, and time taken to complete tasks.

7. Upon completion, participants were asked an open-ended question about their overall experience with the process.

3.5 Data Analysis

This section systematically analyses the data collected from the usability testing sessions to identify patterns, trends, and issues in the user experience. The analysis was focused on the effectiveness of the prototype in meeting the needs and expectations of Stokvel members, as well as the prototype's overall usability. To complement this analysis, a thematic analysis was employed to understand the participants' perspectives and experiences further.

3.5.1 Thematic Analysis

For qualitative data analysis, a thematic analysis approach was employed. NVivo, a computer-assisted qualitative data analysis software (CAQDAS), was utilised to analyse the qualitative data collected from the interviews. This software was selected due to its widespread use in qualitative data coding (Bryman, 2012). The thematic analysis aims to analyse data and identify emerging patterns or themes within the data. This method is particularly beneficial when investigating under-researched topics or working with participants whose views are unknown (Braun & Clarke, 2006).

Transcriptions of the focus group sessions and usability testing were typed verbatim, compiled into a master document, and served as the content and thematic analysis foundation. One constraint of transcribed data is the loss of nonverbal information, such as pacing, intonation, and emphasis in speech (Polkinghorne, 2005). However, any verbal notes and cues were documented during the focus group session and usability testing, aligning them with the transcript. In addition, field notes describing physical nonverbal cues and other observations were also reviewed to provide a comprehensive understanding of the participant's interactions with the mobile application prototype. This study employed inductive coding, allowing the data to speak for itself and generate the codes. Given the limited research on information technology solutions in stokvels, this approach aims to consider all insights by not imposing a predefined coding structure. Instead, the inductive approach allows codes to emerge from the data, offering a deeper understanding of the topic and prioritising

the user's perspective in the application development process. The thematic analysis in this study followed a five-phase approach:

Phase 1 - Coding: The textual data from semi-structured interviews and usability testing sessions were transcribed and coded to systematically identify and categorise key ideas, concepts, and patterns within the data. Using an inductive coding approach, themes emerged organically from the data without imposing a predetermined framework (Thomas, 2006). This process involves reading transcripts multiple times, assigning codes to relevant text segments, and refining codes throughout the analysis. A total of 23 codes were generated in this phase from the 252 lines of text in the transcript.

Phase 2 - Developing Themes: After the initial coding, codes were grouped into broader categories based on their similarities and relationships. These categories were then be further analysed to identify overarching themes encapsulating the core insights and patterns within the data (Braun & Clarke, 2006). This iterative process were involve constant comparison and refinement of categories and themes to represent the data accurately. Six themes were identified in this process.

Phase 3 - Mapping Relationships: Once the main themes are identified, their relationships with the codes are visualised in a table. This step aids in understanding complex interconnections between various aspects of the research findings and offers a clearer picture of the overall structure and organisation of the data (Braun & Clarke, 2006). Excerpts summarising the themes are included as well as the definition of each theme.

Phase 4 - Interpretation and Analysis: With a clear understanding of the themes and their relationships, the researcher interpreted the data, drawing on relevant literature and theoretical frameworks to provide context and a deeper understanding of the findings. This step involves making sense of the data and drawing meaningful conclusions that address the research questions and contribute to the existing knowledge on the topic (Creswell & Poth, 2018).

Phase 5 - Reporting: Lastly, the results of the qualitative analysis were presented, organised, and coherently supported by evidence from the data. This involves weaving together descriptive accounts, illustrative quotes, and interpretations to tell a compelling story that accurately conveys the essence of the research findings (Creswell & Poth, 2018).

3.5.2 Wizard of Oz Data Analysis

The usability testing data analysis was focused on a comprehensive examination of quantitative measures to assess the prototype's effectiveness and efficiency in meeting Stokvel members' needs and expectations. This involved evaluating various aspects of the user experience, drawing on established usability testing methodologies and guidelines (Nielsen, 1994; Rubin & Chisnell, 2008). Although the key focus is on the quantitative data, there is qualitative data to scrutinise when the WoZ experiment is conducted. This includes direct user responses, screen captures, and system logs. The first step in the analysis is to collate and organise this data for clarity and ease of analysis. Here, the primary focus is on evaluating user experiences in the interface - their reactions, queries, errors, and completion rate of given tasks. It is imperative to interpret this data with an understanding of the context and constraints of the participants, mainly since this study targets a demographic with lower literacy and technological familiarity.

Participants were engaged in various tasks to evaluate the prototype, with the precise nature of these tasks intrinsically linked to the features that will be incorporated into the design. The design features are, in turn, based on the themes unearthed in the thematic analysis. As these themes cannot be predetermined, the specific tasks remain undefined until the thematic analysis concludes. Throughout this testing process, participants maintained an open line of communication with the tester via their preferred text messaging platform. This avenue for communication facilitated assistance requests, comments, or questions, enriching the testing experience. The communication logs captured during the testing process provided additional data for analysis this interaction offers an invaluable understanding of the intuitive nature of the system and its areas for improvement. Each testing session was designed to be

concise, at most 20 minutes per participant, to respect their time and ensure focused engagement.

As participants completed the tasks, the following quantitative measures were recorded and analysed:

1. **Task completion rate:** The proportion of participants who complete a given task was determined. This measure offers insights into the effectiveness of the application in facilitating users' achievement of their goals (Sauro & Lewis, 2012).

2. **Time on task:** Participants' time to complete each task was recorded, helping identify potential bottlenecks and areas where users may struggle to accomplish a task efficiently (Nielsen, 1994).

3. **Error rate:** The number of errors participants make while completing tasks were be documented and examined. This metric highlights areas of the application where users may encounter difficulties or misunderstandings (Rubin & Chisnell, 2008). It is calculated as (total number of errors/total tasks)x100

4. **Requests for Clarification:** Instances, where participants ask for assistance or seek clarification during task completion, were recorded and scrutinised. This measure indicates the application's intuitiveness and the interface's clarity of instructions, prompts, and labels (Tullis & Albert, 2013). Frequent requests for clarification suggest that certain elements or interactions within the application are unclear or confusing, necessitating improvements to enhance overall usability and user experience.

Each measure was summarised across all participants using descriptive statistics, such as mean, standard deviation, and median, to identify trends or patterns. A spreadsheet was created to store the data for each participant, with information recorded manually during the exercise. Consistency in units of measurement, notation, and terminology was maintained for all data entries. Upon the conclusion of the testing session, participants were asked for any comments or questions about the process to understand their overall impressions.

3.6 Summary

This chapter presented a systematic and rigorous approach to creating and assessing a mobile app prototype for Stokvels in rural areas. The research strategy prioritised ethical considerations, ensuring cultural sensitivity, privacy, and voluntary participation. Our collaboration with Imijelo, a partnering organisation, further ensured the cultural relevance of the study. Initial data collection was done through a focus group discussion, enabling us to gain valuable input from the intended audience. Additionally, usability evaluation was carried out through live remote testing using the Wizard of Oz technique. Interpreting the qualitative data through a thematic analysis shed light on the Stokvel members' issues, necessities, and expectations. We used numerical data from usability testing, such as the rate of task completion, time spent on tasks, error rate, and the number of requests for clarification, to assess the mobile app interface's efficacy and efficiency. The findings from the thematic analysis and usability testing will guide the subsequent phases of the study. This will allow us to create a mobile app prototype for Stokvels that is user-friendly and culturally suitable for rural communities in South Africa.

Chapter 4: Results & Analysis

This chapter presents a comprehensive overview of the study's findings, derived from the qualitative and quantitative data collected during the research process. The research aims to scrutinise the potential use of a mobile application in managing stokvels within rural communities in South Africa. Our objectives are to understand the operation of stokvels in this context, pinpoint activities that foster social capital, and design a mobile application prototype assessed for its usability and user experience. A two-pronged analysis was employed: a thematic analysis of qualitative data obtained from the semi-structured interviews and an examination of quantitative measures from the usability testing. The interview data was processed using a systematic thematic analysis approach. This approach yielded key themes which provide a profound understanding of the unique operational challenges and intricate financial management processes within stokvels. These themes, rooted in the research questions, offer insights into potential technological solutions for Stokvels' operational issues. In addition, the chapter evaluates the prototype application through usability testing, assessing its efficiency, effectiveness, and overall user experience. The data generated from these tests provide invaluable feedback, informing potential modifications that can optimise the mobile application for the specific needs of stokvels.

4.1 Thematic Analysis of Focus Group Data

4.1.1 Initial Coding

The coding process involves carefully examining responses and grouping them into appropriate codes that capture the observed events. This method is often used in qualitative research, as Creswell (2014) explains. The researcher chose a semi-structured interview style for this study, allowing a wide range of data to be collected. As a result, the important issues and the topics discussed during the interview provided various views that were vital in addressing the research questions.

During the coding process, significant text segments were identified and labelled accordingly to index them in relation to a pertinent theme or issue within the data, a

practice advocated by King (2004). Echoing this sentiment, Boyatzis (1998) proposed that a "sound code" adeptly seizes the qualitative richness intrinsic to the phenomenon. An exemplary demonstration of this procedure is presented in Table 4.1, depicting an excerpt from the transcript linked with the initial codes. A full catalogue of about 23 codes is made available in Appendix 7.3 for further reference.

Initial Codes	Transcript Excerpts
Stokvel Operations	"We are 10 members. We have a pigs stokvel/group. We are raising pigs and then we sell at an appropriate time. We started this project in January."
Communication within the group	"We call our chairperson. We call this chairperson. The chairperson calls members, and we meet here."
Impact of covid on operation	"Mhhh, covid affected us in this way: we once started this thing, then we dropped it because of covid because we couldn't meet, right. So that costed us in that way because we couldn't meet as a team."
Pre-covid operation	"The effect of covid is that when covid started, they had to stop the group because they started long before covid as the group but then when covid started they had to stop and then now they started working again last year."
Financial problems	"Our biggest challenge is money at home, do you understand? Maybe we don't have pigs for example. We still want this. Maybe we don't have pigs, one of us borrows money to buy a pig because they want to do, because they want to slaughter, you understand? Yes, we face so many financial difficulties."

Table 4.1: Example data excerpt with initial codes

4.1.2 Developing Themes

The transition from initial codes to established themes was carried out carefully, ensuring they aligned with the research questions. In Table 4.2 below, these emergent themes are paired with their respective group of codes and instances from the data that aptly depict their application. Collectively, six principal themes were discerned from the interview transcripts, which can be found in Appendix 7.4. A comprehensive

exploration of each theme, addressing them individually, is subsequently undertaken in the ensuing discussion.Creating these themes involved an iterative and reflexive process, in line with Braun and Clarke (2006) guidelines for thematic analysis. The themes were not just extrapolated from the codes but were generated by identifying patterns and making interpretative links between the data. The themes serve as analytical representations of the data, creating a narrative structure linking the various data elements (Spencer et al., 2014).

Theme	Code	Definition	Examples
Operational Dynamics	Stokvel Operations, Communication within the group, Stokvel operations - Loaning, Stokvel operations - Desire for consistency in operation	How the stokvel operates, including the structure of the group, their internal communication, and their primary activities.	"We are 10 members. We have a pigs stokvel/group. We are raising pigs and then we sell at an appropriate time."; "We call our chairperson. We call this chairperson. The chairperson calls members, and we meet here."; "We keep R200 here and then we loan each other the very same money."
Pandemic Impact and Information Dissemination	Impact of covid on operation, Pre-covid operation	The effects of the Covid-19 pandemic on the stokvel's operations and their adaptation strategies.	"Mhhh, covid affected us in this way: we once started this thing, then we dropped it because of covid because we couldn't meet, right."; "The effect of covid is that when covid started, they had to stop the group because they started long before covid as the group but then when covid started they had to stop and then now they started working again last year."
Financial Management and Monitoring	Financial problems, Debt issues with selling, Problems: Non-payment, Problems: Interest accrual	The financial challenges the group faces, including money shortage, issues with debt and non-payment, and internal rules around financial contributions.	"Our biggest challenge is money at home, do you understand?"; "The problem when they sell, they sell together as a group but for one person."; "Jah so every month they contribute R200 each member and then when you do not have the R200 you have to bring R220."

Market Accessibility and Connection	Market for selling pigs, Problems - Desire for external help	The group's challenges with finding a reliable market for their pigs and their requests for external assistance.	"The selling aspect: if you can maybe assist us with market, a place where we can use to sell our pigs after raising them."; "One area in which we need help is the pigs. We want to get help with pigs."
Technological Affordances	Use of WhatsApp, Technology for group communication, In-person meetings as main method of communication, Limited access to smartphones and WhatsApp, Tech savvy relatives helping elders keep up to date with WhatsApp, Role of technology in managing group finances, Positive reception to technology-based solution	The group's interaction with technology, including their use of smartphones and apps, their attitudes towards technology, and their hopes for how technology might improve their operations.	"Interpreter: Okay. Among the members of this group, is there anyone with a phone, do you have computers? Or maybe WhatsApp installed in your phone. Xhosa speaker: "I do have WhatsApp" Xhosa speaker 2: "I also have. We do WhatsApp"; "An app that can do other things like managing the savings and the contributions."; "That could be useful. That could be useful to us, we support it. That could really help us."
Status Monitoring and Personalisation	Group Identity, Progress Monitoring, App Customisation	The group's preferences for an app that can track their progress and is personalised to their group identity.	"They would like to see S****a, which is the name of the group when they open the App."; "Xhosa speaker 3: that is what we wish to see. We wish to see what we want is progressing, when you are opening your phone you see here is S*******a's app. Here is S*******a going forward."

Table 4.2: Themes with corresponding codes

4.1.3 Interpretation and Implications of Key Findings

4.1.3.1 Operational Dynamics and App Navigation:

Reflecting the fundamental workings of the stokvel, it is clear that the participants need a consolidated platform that encapsulates their core activities, such as raising and selling pigs, along with maintaining internal communication, predominantly revolving

around a chairperson. The existence of an internal loan system underscores the necessity of robust record-keeping. Therefore, features such as access to records of their balance, loan information, history of transactions and announcements would ensure seamless operations while preserving the valued tradition of their operations. Since these discussions currently have to take place through the chairperson, who ensures everyone comes together for meetings.

4.1.3.2 Pandemic Impact and Information Dissemination:

The Covid-19 pandemic significantly disrupted the stokvel's conventional operation mode, rooted in physical meetings. The difficulty in making group-wide announcements further compounded this issue. This underscores the paramount need for a trustworthy virtual platform that enhances communication. A feature ensuring that members remain informed of activities and maintain connections, despite physical distancing could effectively respond to the absence of in-person meetings.

4.1.3.3 Financial Management and Monitoring:

Given the group's financial challenges, the app could provide a structured approach to funds monitoring for pig procurement, internal borrowing management, debt recovery, and late contributions penalties tracking. This could offer an effective solution to their financial environment.

4.1.3.4 Market Accessibility and Connection:

The group's challenges in accessing a broader consumer base, as illustrated in the transcript excerpt "The selling aspect: if you can maybe assist us with the market, a place where we can use to sell our pigs after raising them..." underline the importance of an extended network. To reach a wider market and engage with a more diverse pool of potential buyers, it is essential to have a communication mechanism that disseminates important information effectively. This need could be met by incorporating a feature in the app that broadens their connections and ensures important market-related announcements are disseminated to the entire group, thus enhancing their market accessibility. Even though the selling of pigs is a unique characteristic of this particular stokvel, it's important to note that different stokvels have varying focuses. Therefore, while addressing their need for a broader market, the application should be designed generically to cater to diverse stokvels.

4.1.3.5 Technological Affordances:

Despite the noticeable digital divide within the group, participants demonstrated a willingness to engage with technology, specifically mentioning WhatsApp as a tool they currently utilise for communication. The quote, "I do have WhatsApp" and "I also have. We do WhatsApp", underscores the app's role in their routine communications. Indeed, this not only includes the more tech-savvy individuals but also extends to older members, who, as conveyed in the statement, "You see we are with grandmothers here?... Maybe us people who can do those technologies we can continue using them... Then the grandmothers will tell us to discuss that thing, that "okay, answer and say", rely on assistance from younger people to keep them informed via WhatsApp. This situational context calls for the proposed mobile application to be intuitive and user-friendly, ensuring that it caters to members across the digital literacy spectrum and aligns with the group's recognition of technology as a potential enabler.

4.1.3.6 Status Monitoring and Personalization:

The participants expressed a clear desire for real-time updates, which indicates a need for individual recognition within the group's operations. This could be addressed by incorporating features that allow them to track their progress, with the app providing real-time updates on their operational status. Importantly, their request for specific colours and the prominent display of their group's name suggests a strong desire for the application to reflect their identity. This suggests that the branding and design of the application should promote a sense of ownership and resonate with the users, thus fostering a stronger sense of belonging within the app environment.

4.2 User Stories and Prototype Development

4.2.1 Overview of User Stories

Building upon the thematic analysis presented earlier, user stories were crafted as an essential component of this research. These narratives stem directly from the themes discerned from our analysis, encapsulating the Stokvel app users' needs, behaviours, and interactions. As depicted in Table 4.3, every user story offers a detailed account of potential scenarios and engagements with the application, facilitating a nuanced understanding of user requirements within their context. Consequently, firmly

anchored in the identified themes, these user stories provide a comprehensive and user-centric blueprint that guides the Stokvel application's design and evolution, helping bridge the gap between user needs and app features. This subsequent section delves into the development of these user stories and how they influenced the prototype development.

Feature Name	User Story: As a Stokvel member, I want	Acceptance Criteria
Introduction to App	to receive a greeting when initiating the application. The message should clearly indicate that the user has entered a dedicated application, explain its purpose, data confidentiality, and the right to discontinue at any point to ensure an understanding of the nature and boundaries of the interaction.	Upon interacting with the application, receive a greeting encapsulating the information mentioned and asking for consent to proceed.
Stokvel Entry or Registration	an option to either register the stokvel or enter an existing stokvel to interact with the application based on the stokvel affiliation.	Prompted to register the stokvel or enter if it already exists upon choosing 'yes' to proceed.
Stokvel Registration	to register the stokvel using a form of identification, ensuring the security and exclusivity of the stokvel group.	Enter a membership ID during registration.
Membership Role Selection	to specify the role in the stokvel (ordinary member, chairperson, executive committee member), ensuring proper identification and interaction.	Have the option to select the type of membership during registration.
Successful Registration	to receive a confirmation of successful registration and an invitation to enter the stokvel.	After selecting the membership type, receive a success message and prompt to enter the stokvel.
Home Page	to access multiple features from the welcome screen for easy navigation and complete information access.	You can access the home page as a starting point that gives you access to all other features of the application.

Balance Inquiry	to view the total contributions to the stokvel and the date of the next due contribution for effective commitment management.	Select the balance check option to view the total contributions and the next due contribution date.
Stokvel Information	to access detailed information about the stokvel (including member titles and transaction details) for a comprehensive understanding of the stokvel's activities and status.	Choose the stokvel info option to access detailed information, including member titles, transaction details, and other relevant information.
Loan Management	to view loan details, manage pending loan requests, and request a new loan (limited to one at a time) for responsible loan management.	Access the loan option to view loan details, manage pending loan requests, and request a new loan (limited to one at a time).
Announcements	to view all stokvel-related announcements made by the secretary to stay updated about the latest developments. To keep me connected to other Stokvel members.	Select the announcements option to view all stokvel-related announcements made by the secretary.
Error Handling	clear error messages that indicate what went wrong and how to resolve it, ensuring seamless navigation through the application.	Receive informative error messages indicating the mistake and potential solutions for incorrect input. This includes accessing an unregistered profile, entering an incorrect ID, or navigating to an unavailable page.
Backward Navigation	flexibility to revert to the previous step at any point in the application to correct any error or change the decision.	Have the option to return to the previous step or screen at any point in the application.

Table 4.3: Application user stories

4.2.2 Prototype Development and Design Rationale

The proposed design of the Stokvel application seeks integration within the existing WhatsApp framework, envisioning a conversational bot interface. The design rationale borrows from the USSD format, commonly used in feature phones across Africa due to its straightforward and efficient interaction model (Donner, 2008). By utilising WhatsApp's considerable reach and popularity, the design suggests a strategy to simplify the user journey, enhancing usability (Poushter, 2016). This strategy aims to serve existing WhatsApp users efficiently sto and facilitate a frictionless transition to

this digitised platform for those accustomed to traditional stokvel methods. Based on the user stories, the following functionality will be applied within the WhatsApp bot with the corresponding image showing the design.

To conduct usability testing on WhatsApp, the participant interacted with two distinct contacts within WhatsApp. The first contact is the researcher, who provided instructions, pose questions, and guide the participant through the testing process. The second contact is the application prototype, designed to simulate the Stokvel application. The prototype will be operated using the "Wizard of Oz" approach, where the researcher manipulates the responses to mimic a fully functioning application. This approach allows for a flexible and adaptive testing environment. As the participant navigates the tasks, the researcher will monitor and record the participant's responses and interactions. The logs of these interactions will be exported from WhatsApp and securely stored on a cloud platform. This comprehensive record will provide a detailed user journey that can be analysed and used to inform further application development.

4.2.2.1 App Introduction

The user's initial encounter with the application presents a branded image and two clear options: registering a new stokvel or accessing an existing one. This method of offering a choice from the beginning aligns with best practices in successful interface design, directing users towards their intended actions easily and quickly (Norman, 2013). The branded image creates familiarity as the participants in the focus group were members of a stokvel created around piggery farming.
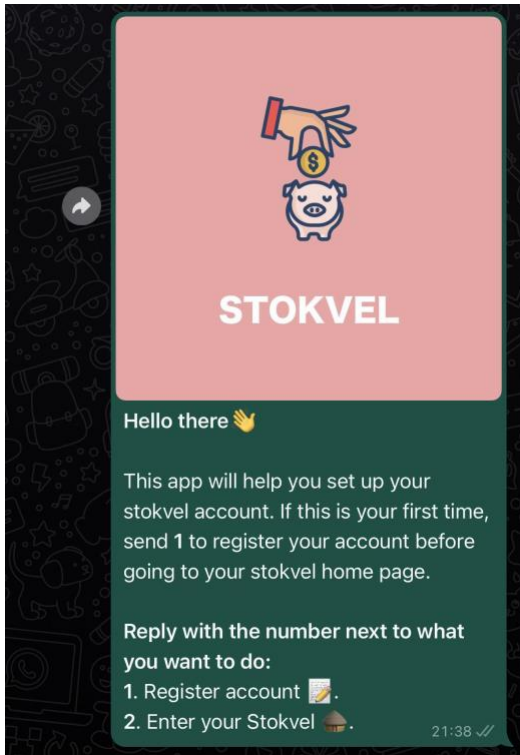
Figure 4.1: App Introduction

4.2.2.2 Guidance During Errors

A key design aspect is providing clear, immediate feedback when users attempt an action without meeting the necessary prerequisites. This reflects Norman's design principles, emphasising the value of prompt and relevant feedback in user interactions (Norman, 1988).
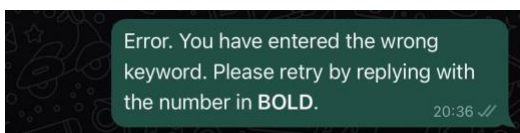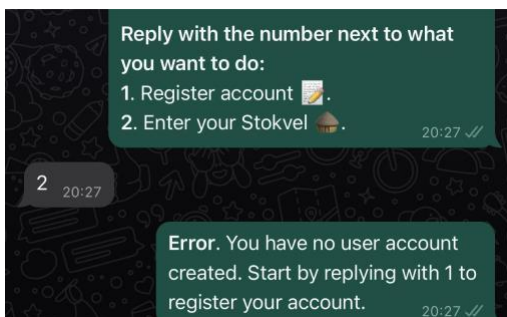

Figure 4.2: Example error message

Figure 4.3: No registered account error

4.2.2.3 User Registration

The registration process within the application asks users for their Stokvel PIN and role, thereby ensuring a secure user experience (Whitten & Tygar, 1999) and facilitates appropriate role-based-access within the group.
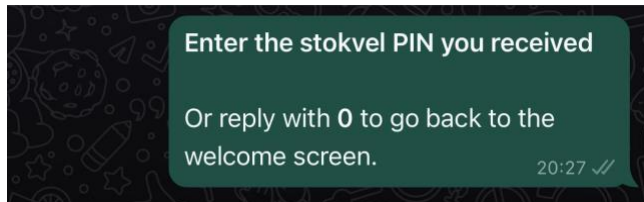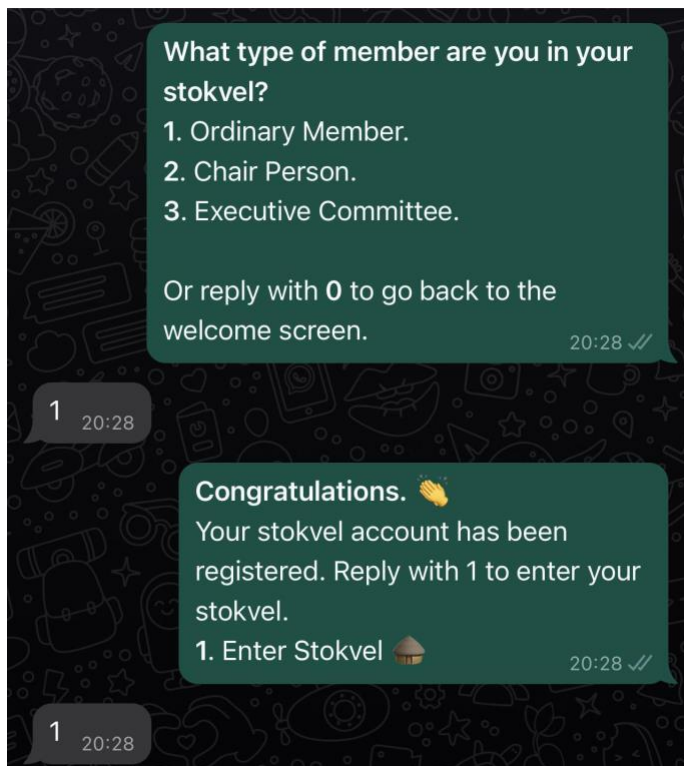

Figure 4.4: Request for PIN

Figure 4.5: Select Membership Role

4.2.2.4 Stokvel Homepage

Upon successful registration, users are directed to a homepage offering various services. These include balance checking, loan applications, transaction history, stokvel information, and group announcements.
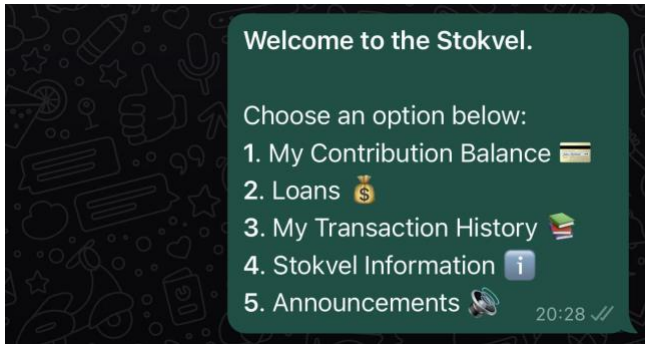
Figure 4.6: Home Page

4.2.2.5 Balance Information

Users can monitor their contribution balance and keep track of the next due date. This feature facilitates efficient personal financial management.
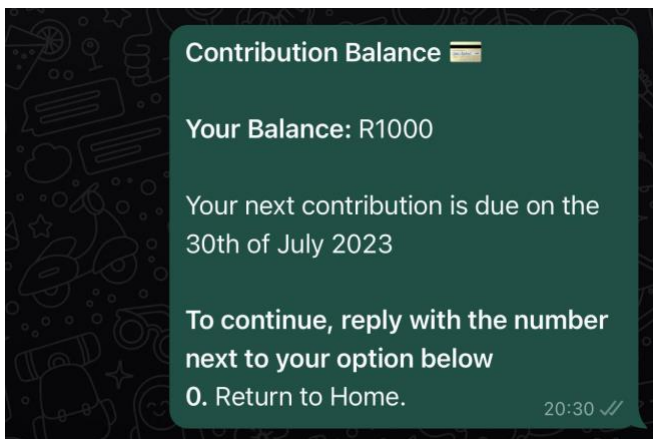

Figure 4.7: Contribution Balance

4.2.2.6 Loan Applications and Management

The 'Loans' feature allows users to manage their loans, review pending requests, and apply for new loans. Multiple confirmation steps are included in this section to prevent unintended actions, aligning with best practices in user interface design (Nielsen, 1994).
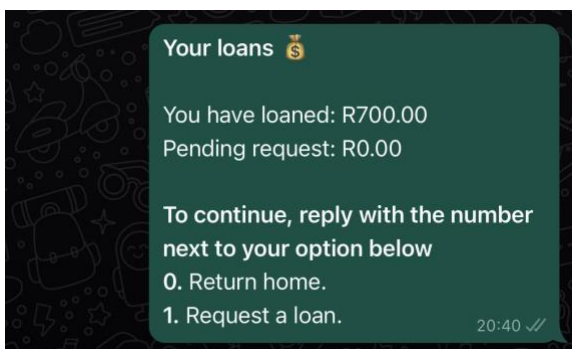
Figure 4.8: Loan Details
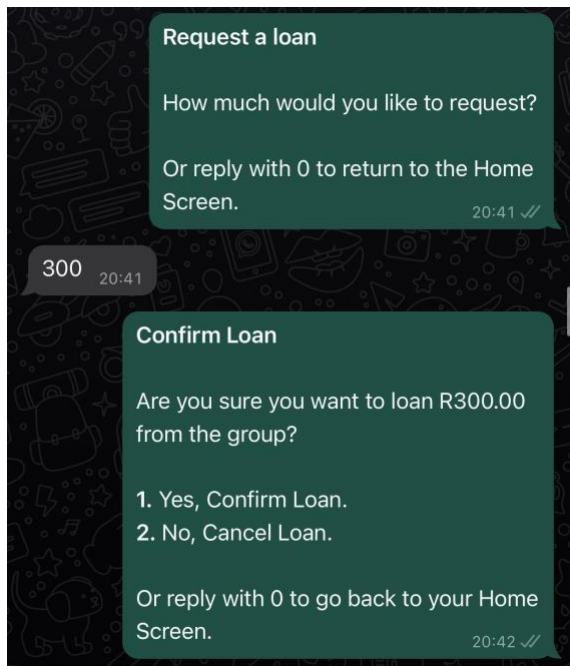
Figure 4.9: Request a Loan

Figure 4.10: Loan Requested

4.2.2.7 Stokvel Details

Access to detailed group information promotes transparency and accountability, allowing users to review the transaction history and member list. This design choice aligns with the principle of transparency in online systems (Birnholtz, Dixon, & Hancock et al., 2012) and reflects the information typically shared in group meetings.
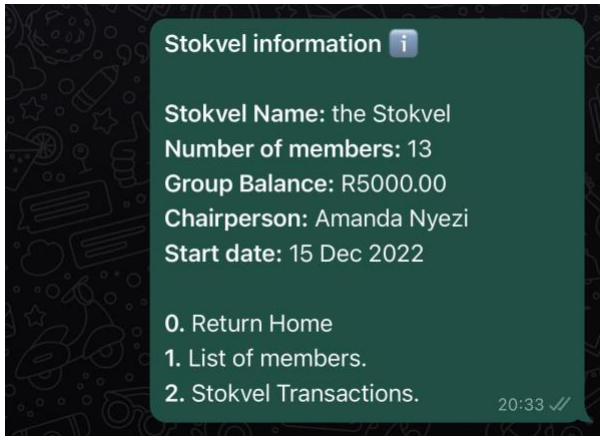
Figure 4.11: Stokvel Information
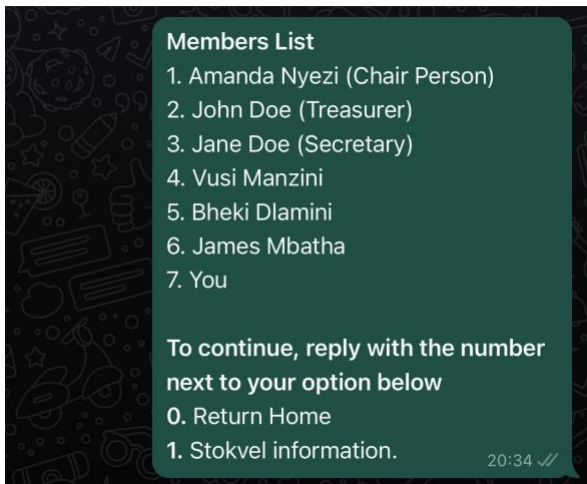
Figure 4.12: Stokvel Members List
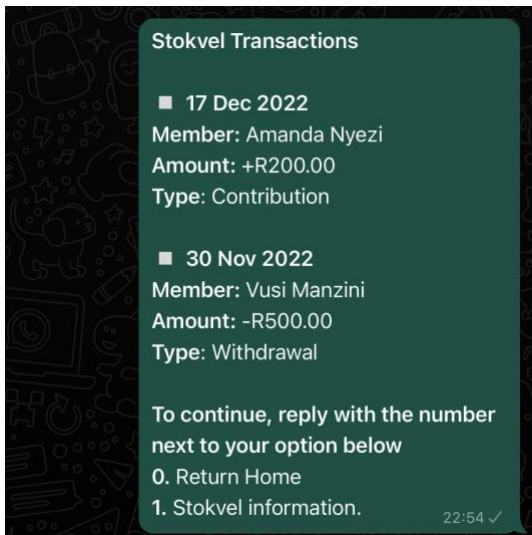
Figure 4.13: Stokvel Transactions

4.2.2.8 Group Announcements

An 'Announcements' feature ensures that users stay informed about group news, maintaining group cohesion and communication, key principles of successful online communities (Preece & Shneiderman, 2009) and cultivating social capital.
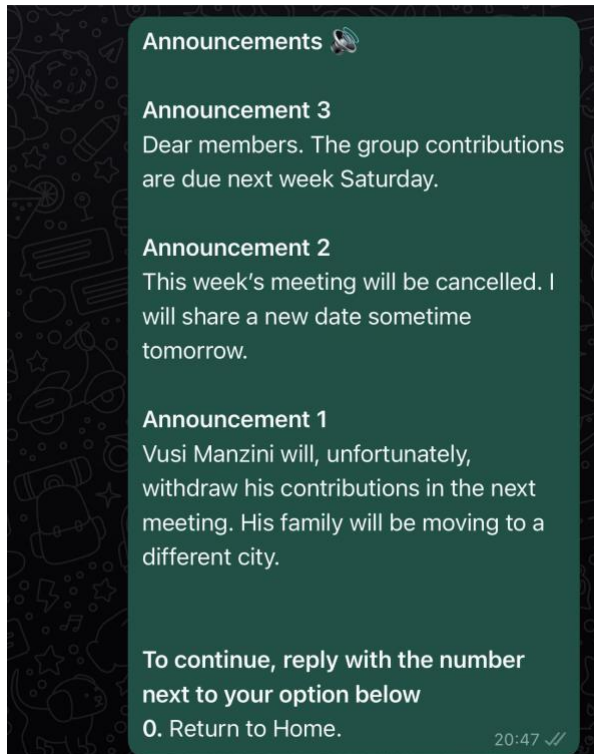
Figure 4.14: Stokvel Announcements

4.2.2.5 Feedback Mechanism

The inclusion of a feedback mechanism reflects best practices in user interface design by encouraging user feedback and facilitating continuous application improvement (Bargas-Avila & Hornbæk, 2011).

4.3 Version 1 Usability Testing

4.3.1 Test Results

In this usability test, four participants were engaged to perform eight distinct tasks within the application. After completing the tasks, the feedback showed saturation, indicating that the participants' experiences converged towards similar themes. The summarised results of the usability test are shown in Table 4.4 below. An example of

the individual usability test for participant #0001 can be found in Appendix 7.5 to show the structure.

Version 1 - Usability Testing					
Measure	**Participant #0001**	**Participant #0002**	**Participant #0003**	**Participant #0004**	**Mean**
Task Completion Rate	100%	100%	100%	100%	100%
Total Time on Task	1879	1081	1882	982	1456
Total Errors	3	2	2	0	1.75
Error Rate	37.50%	25.00%	25.00%	0.00%	21.88%
Requests for clarification	2	1	2	1	1.50

Table 4.4: Version 1 Usability Test results summary

Table 4.4 details the interactions of four participants with the application, demonstrating a complete task success rate of 100%. Despite the overall completion rate, it was observed that errors were more prevalent during specific tasks, such as Account Registration, Find General Stokvel Information and View Stokvel Transaction History.Participants also encountered difficulties during the View Loans task. This task presented a particular challenge as two of the four participants navigated back to the main menu to initiate a new loan request, overlooking the available loan request option within the loans section. The tasks of Account Registration, View Stokvel Announcements, and Request Loan triggered the majority of requests for clarification. This pattern indicates potential areas of ambiguity or confusion within these tasks, underscoring the need for clearer instructions or a more intuitive process flow.

The time required to complete each task varied significantly among participants, with specific tasks causing notable discrepancies. For instance, the Account Registration task required more time from Participant #0001 (306 seconds) and Participant #0004

(320 seconds) compared to Participant #0002 (272 seconds) and Participant #0003 (285 seconds). Similarly, Participant #0003 spent a significantly longer time on the View Loans task (572 seconds) compared to Participants #0001 (235 seconds), #0002 (117 seconds), and #0004 (43 seconds). These variations point towards differences in individual user interactions with the app's interface. Although all participants successfully completed each task, the data captured in Table 4.2, including time spent on tasks, errors made, and requests for clarification, highlight areas for improvement. These insights provide a valuable roadmap for enhancing the usability of the app. Potential improvements include refining the account registration process, improving the clarity of instructions, and optimising the loan request process, all aimed at reducing user errors and improving the overall user experience.

4.3.2 Identified Issues and Iterations

Based on the user feedback gathered from user testing of the first version of the Stokvel application, several adjustments were made to improve the user experience in the second version. These were mostly observed from the users' behaviour as they interacted with the application. These changes were implemented to address specific usability issues and enhance the overall usability and user satisfaction of the application. The following adjustments were made:

Unbundling the Loan Option:

In the application's home page, the loan option was unbundled into 'Loan Balance' and 'Request Loan'. This modification aims to make the specific actions stokvel members require more easily accessible. In the first version, both features were grouped under a single 'Loans' option, which could confuse users. Stokvel members can directly access the desired loan-related functionality by separating them into distinct options without unnecessary navigation. This adjustment simplifies the user flow and improves the efficiency of interacting with loan-related tasks.
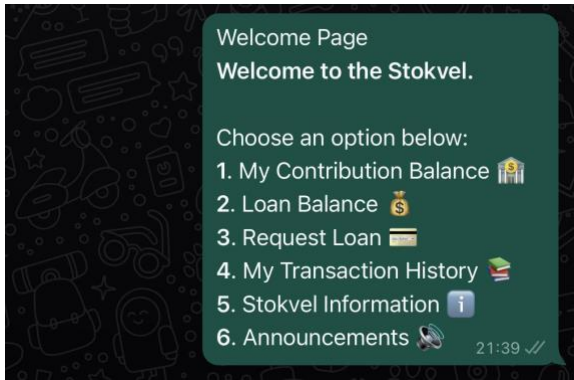
Figure 4.15: Home Page Update

Date-based Announcements:

In response to user feedback, the second version now presents announcements with associated dates, replacing the previously used numbering system. This update was primarily driven by user inputs expressing confusion and difficulty identifying the most recent announcements. One user, Participant #0001, highlighted this issue by noting, "The last listing of announcements, the numbering - not sure which one is first since the number starts with the last." This comment indicates a challenge in understanding the sequence of the announcements due to the numbering format. Similarly, Participant #0002 expressed uncertainty, saying, "It was fine. But the announcement question confused me a bit." This feedback underscores the necessity for a more intuitive and user-friendly approach to presenting announcements. By associating each announcement with a specific date, stokvel members can easily identify the most recent updates and understand when the secretary shared them. This adjustment significantly improves users' ability to keep abreast of the latest developments within their stokvel, enhancing the overall user experience.

Figure 4.16: Announcements

Separating Feedback Questions:

To streamline the testing process and encourage more detailed feedback, the feedback questions were removed from the mobile application flow and integrated into the researcher question flow. This adjustment was made to create a more comfortable environment for stokvel members to provide feedback without feeling under examination conditions within the application. By shifting the feedback interaction to the researcher question flow, participants can freely engage and provide feedback based on their familiarity with the researcher. This modification aims to encourage open and spontaneous responses, as stokvel members previously encountered difficulties transitioning from number-based navigation to providing feedback in written form.

The modifications introduced in the second version of the Stokvel application have been implemented to refine the user experience by addressing feedback from the initial version. Changes such as the unbundling of the loan option, the introduction of date-based announcements, and the separation of feedback questions have been strategically incorporated to boost usability, provide clearer guidance, and facilitate user engagement. The revised application aims to provide a more user-centric platform, enabling Stokvel members to manage their financial activities more easily and efficiently. However, it is crucial to recognise that some user feedback arose from

confusion regarding specific details intrinsic to the nature of the prototype. For example, Participant #0008 provided valuable feedback highlighting some of these points. In one instance, the participant remarked, "When I was already on the Stokvel transactions page, I was confused why I couldn't see my transactions there as well. I was expecting to see the loan I took there too." This observation pertains to the fictional data utilised in the prototype, where specific transaction details such as stokvel contributions were not included in the transaction list, which would not be the case in a fully functional application. Similarly, another question posed by Participant #0008, "I think having a better explanation as to why I can only request one loan at a time or rather what that means, i.e., I have to pay off the first loan before requesting again?" reflects a need for further clarity on the application's loan policies. This feedback might be considered for a future application version if a stokvel does not allow multiple loan requests at a time. Additionally, some feedback involved feature requests that exceeded the scope of the current prototype, such as including a link to chat directly with members from the application. While these suggestions may not be part of the immediate design, they provide valuable insights into user preferences and the potential direction of future development.

4.4 Version 2 Usability Testing

4.4.2 Test Results

In analysing the four participants' version 2 usability testing results, several key findings become evident. A notable observation is the successful completion rate of 100% across all participants, mirroring the findings from the previous round of usability tests, as detailed in Table 4.4.

Version 2 - Usability Testing					
Measure	Participant #0005	Participant #0006	Participant #0007	Participant #0008	Mean
Task Completion Rate	100%	100%	100%	100%	100%

Time on Task	890	1860	1613	969	1333
Total Errors	0	2	1	1	1.00
Error Rate	0.00%	25.00%	12.50%	12.50%	12.50%
Requests for clarification	0	1	0	0	0.25

Table 4.5: Version 2 Usability Test results summary

In the examination of the usability testing results, it is clear that all participants achieved a 100% task completion rate. However, variations in the time on task, occasional errors, and instances of clarification requests provide essential insights into user behaviour and interaction with the application. The participant who spent the most time on tasks was Participant #0006, totalling 1860 seconds. Notably, this participant faced a misunderstanding during the Find General Stokvel Information task, which led to an extended duration for this task. Participant #0006 clarified this by stating, 'I thought you were asking how much each member contributed if the total amount is 5000,' indicating a misinterpretation of the task's instructions rather than a misunderstanding of the application itself. Another noteworthy behaviour was observed in Participant #0006, who referred to previous responses to answer subsequent queries. This behaviour reflects the usability of the application's chatbot format, where users can scroll back to access prior information and responses. This insight provides a unique perspective on how users interact with the information provided within the application.

Similarly, Participant #0007 also encountered a misunderstanding of instructions during the Balance Enquiry task, which resulted in a request for clarification. Upon repeating the instructions, Participant #0007 was able to provide the necessary information, thus completing the task. This behaviour underscores the importance of clear and precise instructions within the application, as the errors encountered were primarily due to instruction misinterpretation rather than application comprehension.

A comparison between the current usability results and the previous findings in Table 4.4 reveals noteworthy improvements. The time on the task required for tasks such as Account Registration and View Loans has decreased across participants, indicating an improved efficiency in the application's design. The request for clarifications, primarily triggered by tasks such as Account Registration and Request Loan, also reduced, suggesting that the application's instructions have become clearer over time. As for error rates, Participants #0006, #0007, and #0008 demonstrated error rates of 25%, 12.5%, and 12.5%, respectively, while Participant #0005 experienced no errors. These rates are lower than those observed in the previous iteration of usability testing. It is essential to note, however, that these errors were due to instruction misinterpretation rather than application comprehension, underscoring the effectiveness of the application's design and functionality.

Chapter 5: Discussion

This discussion chapter further examines the implications of the research results presented in this dissertation, which centres on the potential of mobile applications for managing Stokvels in rural South African communities. The research results illuminate the operational dynamics of Stokvels, the activities that foster social capital within these groups, and the possibility of incorporating these facets into a mobile application, which led to the creation of a prototype for usability testing and feedback collection. Thematic analysis of the results identified a few critical needs in the target user group, such as the demand for a comprehensive platform for record-keeping, enhanced communication channels, and an efficient system for loan requests. Notably, despite the significant digital divide in these rural communities, the research results reveal a current readiness among the participants to adopt technology. The usability testing provided robust results, with a task completion rate of 100% across both prototype versions, indicating a sound foundational design—however, varied error rates and requests for clarification highlighted areas for improvement. Following adjustments, including task simplification and clarity enhancement, user interactions improved, but additional refinement of instructions is necessary to prevent misunderstandings. The research also exposed several limitations that deserve attention. First, the restricted research timeframe limited the possibility of observing users' long-term application use and integration. The usability testing was conducted in English, which might not have captured specific nuances that could emerge if the test had been conducted in isiXhosa, the native language of the participants. The remote format of the usability testing further limited the possibility of observing physical reactions and body language, which can offer valuable insights into the user experience. These considerations offer vital pointers for future research directions.

5.1 Thematic Analysis

The investigation's central theme was the transformative effects of the Covid-19 pandemic on the modus operandi of stokvels. This finding aligns with the expectations of the study, taking into account the global disruption Covid-19 has created in various sectors, including communal savings groups, as substantiated by Adegbite et al.

(2022). The in-person meetings that were the backbone of stokvel operations were abruptly curtailed, presenting profound challenges, specifically in communication, as reflected in the participants' testimonies. To mitigate these complications, the study participants indicated a robust demand for a virtual platform to bridge the communication gap and distribute information effectively. This finding echoes the insights of Bophela and Khumalo (2019), who underline the necessity for adaptability and enhanced communication systems in stokvels, especially during moments of crisis. Integrating digital functionalities for disseminating group-wide notifications and maintaining connections despite physical distancing into mobile applications would correspond with the study's findings and prior research. The study's findings also illuminated some unexpected aspects. Firstly, the Covid-19 pandemic exposed stokvels' heavy reliance on in-person meetings, which was drastically impeded due to pandemic-related restrictions. While this made group-wide announcements and the overall flow of information a significant challenge, it also revealed a latent potential for the digital transformation of these communal savings groups, a phenomenon widely observed in the literature (Biyela, Tsibolane, & Belle, 2019; Suri & Jack, 2016).

Our findings were translated into the development of user stories and a prototype for an app that encapsulates features fostering communication and aiding the dissemination of information, particularly critical during a pandemic scenario. This approach ties in with the broader narrative in the literature about the growing emphasis on ICTs for facilitating operations in stokvels, despite the challenges associated with their adoption, such as limited internet access, electricity shortages, and the absence of widespread credit card usage (Egbe & Mutanga, 2016; Johnston et al., 2015). Notably, our findings exhibit a degree of divergence from the works of Buijs (1998) and Vonderlack and Schreiner (2002), who propose that stokvels primarily rely on close-knit, informal relationships among members, thus eliminating the need for formal record-keeping and facilitating low transaction costs. Our study indicates that as stokvels pivot towards digitisation, the demand for more formal and reliable record management is increasing, affirming the work of Biyela, Tsibolane, and Belle (2019). While digitisation presents significant opportunities for stokvels, it also raises potential concerns about inclusivity. The limitations of mobile applications that predominantly cater to younger, tech-savvy users have been acknowledged (Tiwari & Gupta, 2020). As stokvels strive to adopt digitised operations, it will be imperative to ensure that the

applications are accessible and user-friendly for all members, regardless of age or digital literacy level.

5.1.1 Operational Dynamics, financial management and Monitoring

The results of our study provide insights into the operational dynamics of stokvels and their implications for the design of a mobile application. The findings align with previous literature, which suggests that stokvels function as semi-formal financial systems, offering members access to credit, savings, and investment opportunities (Verhoef, 2001). Our study confirms the critical role of stokvels in community-based economic activities, as Mulaudzi (2017) discussed, supporting the operational dynamics theme. Additionally, our findings highlight the importance of a chairperson in the stokvel's operations, echoing the centralised structure identified by Mashigo and Schoeman (2012). Participants in the focus group have mentioned how critical the chairperson is when bringing together the whole group. The thematic analysis revealed participants' desire for a consolidated platform encompassing various stokvel activities, including pig farming and internal communication. This discovery aligns with our study's aims, which sought to investigate the operational dynamics of stokvels. It also echoes the findings of Matuku and Kaseke (2014), who highlighted effective leadership, transparency, and financial management as critical factors for successful stokvel operations. Therefore, integrating features in the mobile application that grant access to financial records, loan information, transaction history, and announcements could address these identified needs, facilitating the smooth functioning of stokvels.

The focus group results highlight that Stokvels' internal loan system is integral, underscoring the necessity for robust record-keeping. This becomes particularly crucial when confronting financial difficulties such as scarcity of funds, debt issues, and non-payment problems. Our research indicated that a mobile application offering structured means for monitoring funds, managing internal borrowings, tracking debt recovery, and imposing penalties for late contributions could alleviate these issues (Biyela et al., 2019). This suggestion aligns with prior research emphasising the need for effective financial management within stokvels (Matuku & Kaseke, 2014). Thus, with its integrated functions, the proposed mobile application could create an

environment that bolsters financial management within stokvels. This prototype empowers members to manage their contributions and loans, enhancing transparency and accountability, thereby improving the overall financial environment of the stokvels (Duncombe & Boateng, 2009). Our study accentuates the importance of members' access to balance records, loan information, transaction history, and announcements to ensure seamless operations while upholding the valued tradition of stokvels. These findings contribute to the existing body of evidence on the financial management practices within stokvels (Bophela & Khumalo, 2019; Cameron & Ananga, 2015; Kedir, 2005; Musinguzi, 2016).

5.1.2 Market Accessibility and Connection

Our study uncovered an unexpected hurdle: stokvels struggle with market accessibility and connection, particularly when attempting to sell their pigs. This discovery diverges from the existing literature, as previous studies have yet to delve into the market access issues stokvels face thoroughly. This gap in understanding presents a promising avenue for future research to delve deeper into these challenges and formulate tailored solutions. However, this finding could introduce an inconsistency with the established literature. The necessity for a broader consumer base and efficient information distribution is a common obstacle for community-based enterprises (Boso, Story, & Cadogan, 2013).

5.1.3 Technological Affordances

Our study illuminated a significant digital divide within our cohort yet concurrently demonstrated a strong proclivity among participants to interact with technology, primarily WhatsApp, as a principal communication medium. The phrases "I do have WhatsApp" and "I also have. We do WhatsApp" encapsulate the recurring role of this platform in their communicative behaviours. This technology adoption was wider than the younger or more technologically adept individuals but also older participants. As articulated in the quote, "You see we are with grandmothers here?... Maybe us people who can do those technologies we can continue using them... Then the grandmothers will tell us to discuss that thing, that "okay, answer and say", older members often depended on the younger generation to mediate their interactions via WhatsApp.

These findings underscore the imperative for our proposed mobile application to prioritise user-friendly and intuitive design to cater to varying degrees of digital literacy within the group. Furthermore, this aligns with the collective perception among participants that technology can serve as an enabler, fostering inclusivity and cohesion. Further, it is remarkable to note the participants' propensity to engage with technology, despite the evident digital literacy gap. This finding is significant, especially in light of a broader research context indicating that the readiness to adopt technology plays a crucial role in its subsequent acceptance and utilisation (Chigona et al., 2010). The finding that older group members often depended on younger ones for digital literacy is consistent with the research on intergenerational technology learning (Xie et al., 2012).

Our study's insights also underscore the importance of user-friendly design tailored to the intended audience, encompassing those with varying degrees of digital literacy. Technological readiness within the group, mirrored in their inclination to embrace applications like WhatsApp, resonates with the findings from Donner and Escobari (2010) that indicate a growing trend of mobile technology usage among lower-income demographics. The observed reliance of older, less digitally literate members on their younger, tech-savvier counterparts also aligns with previous findings (Bencivenga, 2017; Cáceres & Chaparro, 2017; Eynon & Helsper, 2015; Tatnall, 2014). Considering these insights and the varied digital literacy spectrum within the group, designing a mobile application that is intuitive, user-friendly, and universally accessible is paramount. In developing user stories and the prototype, we aimed to ensure a gratifying user experience catering to the diverse technological competencies within the stokvels. Importantly, our findings echo the research indicating that technology adoption and efficient use do not necessarily correlate with the user group's digital literacy level, underlining the importance of leveraging popular and familiar platforms like WhatsApp to promote usability and user acceptance (Berker et al., 2006). Furthermore, our results reinforce the need for digital financial solutions to accommodate partial literacies, given that increased usage does not equate to proficiency or comfort, especially in populations with varying literacy levels (O'Neill et al., 2014). Therefore, the design and development of these solutions should align with literacy initiatives, ensuring inclusive and practical use while accommodating users with diverse literacy levels.

5.1.4 Status Monitoring and Personalisation

Our results affirm the user-centric approach in HCI, advocating for understanding the unique user needs and preferences when designing and prototyping mobile ICT solutions, particularly for informal and savings groups in developing regions (Anckar & D'Incau, 2002; Clarke, 2001). Our findings also reveal a strong desire for personalisation, notably in monitoring and branding within the app, aligning with Faste (1987) emphasis on the role of personalisation in technology adoption and identifying genuine needs. This preference appears especially prominent within this stokvel context, pointing to the necessity for proposed applications to accommodate robust personalisation features to foster user adoption. A mobile application integrating features for progress tracking and personalisation would address these user preferences, mirroring the emphasis in HCI literature on user-centric design and prototyping (Brown & Grinter, 2016; Medhi-Thies et al., 2015). Furthermore, the findings align with the broader characteristics of users in digital informal savings and loan groups, as defined in the literature (O'Neill et al., 2014; Rumney, 2021). The design aligns with the group's current behaviours and technology usage patterns by adhering to user preferences for real-time updates, personalisation and group identification. This indicates that fostering a sense of ownership and identification within the app environment can elevate user engagement and satisfaction, thereby validating the guidelines posited by prior HCI studies (Faste, 1987; D. Norman, 1988; Sanders, 1992).

5.2 The Rationale for a WhatsApp Prototype

Given the frequent mentions of WhatsApp during our focus group discussions, it is essential to understand our findings within the larger framework of this globally recognised messaging platform. Our discovery of WhatsApp's significant role is consistent with studies that contrasted Short Message Service (SMS) and WhatsApp messaging (Church & deOliveira, 2013). As a universally accessible, encrypted messaging platform, WhatsApp provides many communication methods, from text and voice messages to video calls and multimedia sharing (Udenze, 2017; WhatsApp, 2023). Notably, Church and deOliveira (2013) discovered that WhatsApp's

conversational and interactive nature leads to more frequent exchanges within tight-knit social circles and a greater propensity for group communication. Within the scope of stokvel members, this is echoed in Menze and Tsibolane (2019) study on the utilisation of social media by marginalised populations and online stokvels. This indicates WhatsApp's critical role in the evolution of traditional stokvels, fostering innovative socio-cultural ties and promoting the ethic of ubuntu, a sub-Saharan philosophy encapsulating collective humaneness. Furthermore, this is in harmony with Shambare (2014) premise that adopting WhatsApp is instrumental in disrupting the cyclic trap of technological poverty in South Africa. These findings suggest that, while analogous to traditional SMS in intent, WhatsApp's interactive and social nature promotes richer and more frequent engagement, thereby leading to higher coordination and group messaging. The significance of WhatsApp is also evidenced in its user statistics. With over 2 billion monthly active users globally, reported by Statista (2022), WhatsApp is predominantly favoured, particularly in developing countries. The global lockdowns precipitated by the COVID-19 pandemic saw an unprecedented surge in its use, with users spending over 15 billion minutes per day on WhatsApp calls, necessitating the company to expand the capacity of group calls (HT Tech, 2020). South Africa follows the trend, with WhatsApp outpacing other popular social media platforms (Figures 5.1 and 5.2).
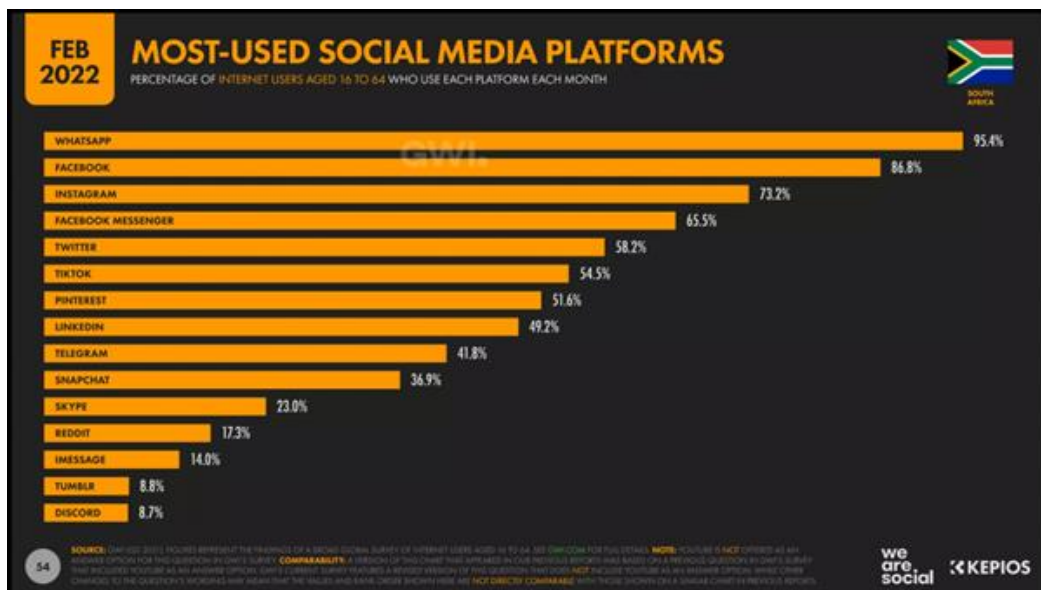

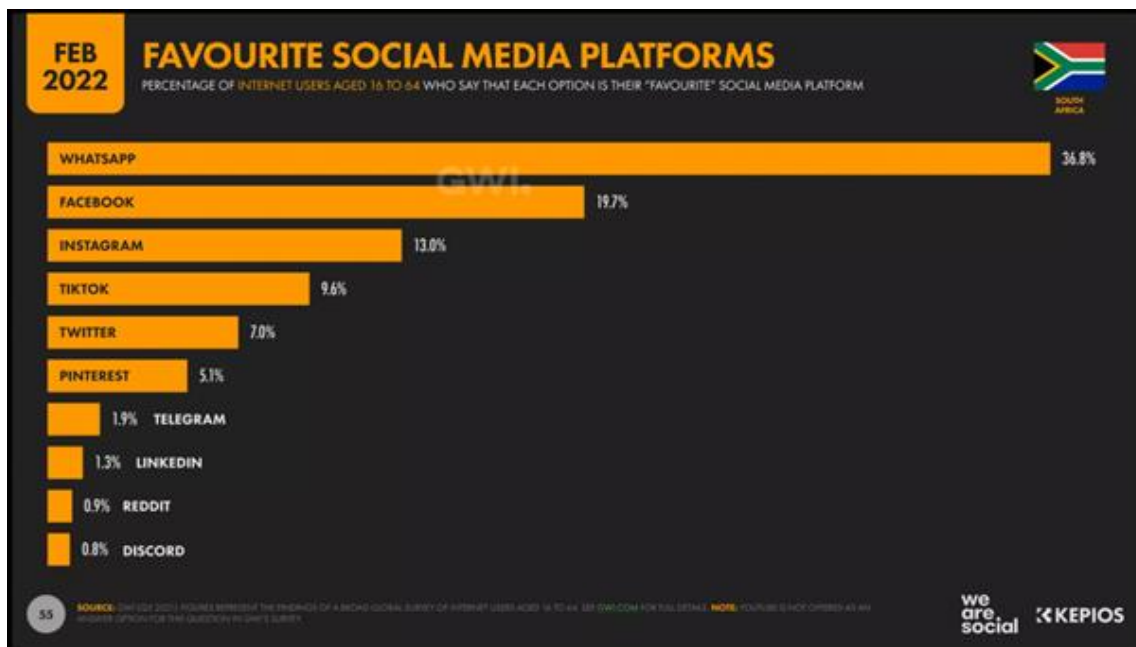Figure 5.1: Most active social media platform in 2022. Retrieved from

https://datareportal.com/reports/digital-2022-south-africa

Figure 5.2. Favourite social media platform in 2022. Retrieved from:

https://datareportal.com/reports/digital-2022-south-africa

GeoPoll's 2020 survey underscores WhatsApp's immense popularity in South Africa, with over 95% of respondents using it for communication and daily news updates. User preference and fidelity to WhatsApp are primarily attributed to its robust Web 2.0 features, such as instant messaging, real-time browsing information, user status indicators, individual and group communication options, and forum discussions (GeoPoll, 2020). These interactive, collaborative, and conversational networking capacities (Kaplan & Haenlein, 2010) are also augmented by instantaneous feedback capability in the Facebook and Messenger family, promoting a participatory platform for information exchange (Churcher, Downs, & Tewksbury, 2014).

When comparing the role of WhatsApp in stokvels with its role in education, the platform's impact in rural areas during the COVID-19 pandemic comes to the forefront (Bouhnik & Deshen, 2014; Cetinkaya, 2017). Despite challenges such as access, affordability, and data concerns, WhatsApp has emerged as a critical facilitator of ongoing academic engagement. WhatsApp's broad reach via smartphones allows for remote learning (Cetinkaya, 2017). Bouhnik and Deshen (2014) further emphasise that the platform's cost-effectiveness and accessibility, even in rural locales, make it a precious resource for marginalised students with limited access to learning devices. Aligning with these observations, a study by Kariuki and Ofusori (2017) reveals that

numerous stokvels in Durban, South Africa, leverage WhatsApp's group feature to manage their activities. Key advantages include cost-efficiency - eliminating physical meetings and curbing communication expenses - and a conducive environment for transactions and communication, fostering active member participation and engagement. Further studies also suggest that using WhatsApp in stokvels enhances accessibility for members remotely from the stokvel's physical location. As Van Zijl and Soni (2020) suggested, this feature allows members to contribute and participate from their homes, thereby boosting overall engagement. Lastly, Van Zijl and Soni (2020) propose that WhatsApp usage in stokvels can foster transparency and accountability, as all members can record and monitor transactions. Considering the mentioned evidence, it strongly suggests that WhatsApp presents a suitable platform for the proposed Stokvel application due to its widespread use, user-friendly features, and cost-effectiveness.

5.3 Usability Testing

5.3.1 Adherence to Usability Standards

The results of our study are consistent with the expectations outlined in the literature regarding the use of user stories in application development and the emphasis on user-centred design to communicate requirements effectively (Beyer & Holtzblatt, 1998; Cohn, 2004; Lucassen et al., 2016; R. C. Martin & Martin, 2006). Our findings demonstrate the successful implementation of user stories in identifying and incorporating desired functionality, supporting the idea that user stories guide design decisions and promote an iterative development approach (R. C. Martin & Martin, 2006). We followed the user story format, ensuring that each feature explicitly connects a user role to an action and an expected outcome, as suggested by previous research (Cohn, 2004).

In the design phase, our application followed Jordan (1998) usability principles and Google's Material Design principles, chosen considering the project's constraints: limited development resources, time constraints, and the prevalence of the Android operating system in South Africa. Although material design provides us with the foundation on user interface design, it is important to recognise that currently existing usability models do not capture the complex nature of interactions in mobile

applications (Zahra, Hussain, & Mohd, 2017). In HCI, prevalent design paradigms have been criticised for grounding in Western epistemological and methodological traditions, which inherently introduce biases (Adamu, 2019; Ali, 2016). This is particularly significant in the context of mobile application evaluations, a burgeoning field within Information Technology. Standard guidelines such as those proposed by ISO and Nielsen have traditionally been applied in these evaluations (ISO, 1998; Nielsen, 1994). These guidelines, while serving as a baseline for general evaluation, have been the subject of ongoing debate regarding the applicability of general versus specific usability metrics (Coursaris & Kim, 2011; Hornbæk, 2006; Hussain, 2012). Furthermore, the critical distinction between desktop and mobile platforms necessitates a focused approach to evaluation. With their unique constraints, including limited bandwidth, memory space, screen size, and small keypads, mobile platforms pose distinct challenges, making desktop-centric evaluation guidelines less suitable (Hussain, 2012; Hussain & Kutar, 2009; Zhang & Adipat, 2005).

The decision to integrate the application within the existing WhatsApp framework was an unexpected finding and deviated from the literature provided. However, this strategy of leveraging WhatsApp's popularity and straightforward and popular interaction model aligns with the user-centred design philosophy by prioritising usability (Donner, 2008; Poushter, 2016). The interface designs of the prototype efficiently integrate WhatsApp's extensive reach with the straightforward USSD interaction model, reflecting the functionality required to operate a stokvel (Donner, 2008). This combination provides a seamless platform for current WhatsApp users and those familiar with traditional stokvel methods, as we build upon an existing mobile application already used by participants. Despite this unexpected finding, the implemented design met usability standards by providing feedback (Bargas-Avila & Hornbæk, 2011; D. Norman, 1988), ensuring error prevention and recovery (Jordan, 1998), and facilitating easy access to necessary services and information (Nielsen, 1994; D. A. Norman, 2013). The designed features of the application promote transparency and accountability, in line with the findings of Birnholtz, Dixon, and Hancock (2012), and foster communication and cohesion, which are essential components of thriving online communities, as outlined by Preece and Shneiderman (2009).

Our study introduces a unique approach that combines high-fidelity and low-fidelity prototyping elements, which deviates from the literature. WhatsApp was utilized with the Wizard of Oz testing methodology as a testing platform, providing an alternative perspective on the prototyping process. By leveraging a platform that already has a polished and refined interface, a low-fidelity approach was employed in terms of design implementation. Nevertheless, the commitment to a user-centred design approach remained unwavering, as emphasised in our study and the reviewed literature. This combination of high-fidelity and low-fidelity prototyping allowed us to benefit from each approach, contributing to a comprehensive and user-centric design process. This study expands the current knowledge of user-centred design for mobile applications by reinforcing the importance of user stories, usability standards, and effective communication. Additionally, unique insights into the practical implementation of these principles are offered. Although our findings occasionally differ from the existing literature, they contribute positively to the field and suggest new directions for future research and practical application.

5.3.2 Usability Evaluation

As prior studies have found, the 100% task completion rate achieved in our usability testing aligns with expectations and the usability criteria defined by Nielsen (2012), indicating that the application is usable and effective in enabling users to accomplish their tasks. However, the varying task completion times, requests for clarification, and occurrence of errors offer valuable insights into areas requiring further refinement. These results build on existing evidence of the importance of identifying user experience issues through usability tests, as emphasised by Shneiderman and Plaisant (2010). Specific tasks such as Account Registration and View Loans present more significant challenges to users, as indicated by the higher number of errors and clarification requests. This observation is consistent with the need for more straightforward instructions and a more intuitive process flow outlined in the literature (Nielsen, 2012; Shneiderman & Plaisant, 2010). The variations in the time required to complete tasks among participants highlight the importance of considering user diversity and tailoring the interface to accommodate various user behaviours and preferences. The iterative nature of our usability evaluation process, as Nielsen (2012) recommended, allowed for continuous improvement and alignment with high-level

requirements. The adjustments made in the second version of the Stokvel application addressed specific usability issues identified through user feedback and the findings from the usability testing. These adjustments, such as unbundling the loan option and introducing date-based announcements, align with the principles of efficiency and learnability, enhancing the overall user experience. Shifting the feedback questions from the mobile application flow to the researcher question flow was another adjustment to encourage open and spontaneous responses, reflecting satisfaction and user engagement (Nielsen, 2012).

Acknowledging that some user feedback arose from confusion regarding specific details intrinsic to the prototype's nature, indicating the study's potential limitations is essential. However, these conflicting data points provide valuable insights for future development and potential enhancements to meet user expectations and needs. These adjustments were made per the iterative nature of usability testing and the need to continuously refine the application. Regarding methodology, adopting remote synchronous usability testing, as Andreasen et al. (2007) recommended, proved effective in overcoming limitations associated with subject pools and logistical challenges. This approach allowed for real-time interaction and observation of participants' performance. The Wizard of Oz (WoZ) method, employed in this study, facilitated the evaluation of innovative interfaces and complex systems, particularly in low-literacy environments. The adaptability of the WoZ method allowed for the incorporation of context-specific cues and localised interfaces, enhancing intuitive and user-friendly interactions (Dahlbäck, Jönsson, & Ahrenberg, 1993). Data collection primarily involved capturing screen interactions and collecting behaviour logs in line with established practices (B. Martin & Hanington, 2012).

5.4 Integrating Activities to Foster Social Capital

The convergence of research findings and thematic analysis identifies several activities that contribute to the development of social capital. These activities serve as a foundation for designing a WhatsApp-based mobile application that effectively enhances social capital among its members (Putnam, 2000). A shared group identity is essential in building a sense of belongingness and trust, strengthening social capital (Williams, 2006). The focus group results also support this notion, as participants

expressed their desire to personalise the application to their group identity. To reinforce this, the mobile application should embody the group's identity through customisable features, group-specific branding, and a sense of community pride. Furthermore, cultivating a sense of collective responsibility and achievement through progress monitoring motivates members to pursue the group's objectives actively, thus fostering social capital. The application design can incorporate features that allow members to track progress, celebrate milestones, and collectively measure achievements, promoting a shared sense of accomplishment. Communication is vital in developing shared values and understanding, critical elements of social capital (Haythornthwaite, 2005). The transcripts' evidence of active communication underscores the importance of incorporating features in the application design that facilitate robust group communication. Leveraging WhatsApp's built-in group communication tools, the application should prioritise seamless and user-friendly communication functionalities, enabling members to share messages, files, and resources efficiently. Shared financial responsibility within the group strengthens interpersonal relationships and fosters community, thus promoting social capital (Putnam, 2000). The mobile application can encourage shared financial responsibility by providing features that allow members to contribute, track their contributions, and engage in transparent financial management. Mutual aid in times of difficulty demonstrates trust and support within the group, further enhancing social capital (Ellison, Steinfield, & Lampe, 2007). The mobile application can facilitate mutual aid by incorporating features that enable members to request assistance, provide guidance, and offer support to fellow members, fostering a supportive and interconnected community. WhatsApp's familiar and widely used interface contributes to developing trust and predictability within the group. Creating group chats or dedicated channels is already embedded within WhatsApp, allowing members to easily communicate, seek advice, and provide support, aligning with the interpersonal connectivity described by Coetzee and Cross (2002).

5.5 Limitations of the Study

The study was confined to a specific time frame, potentially limiting a comprehensive user experience assessment. Although the prototype's usability testing and evaluation

provided crucial insights, an extended observation period could have yielded a more thorough understanding of how users incorporated the application into their daily routines and the difficulties they faced. As a result, the time constraint might have led to an incomplete depiction of the user experience. The methodology of convenience sampling poses another limitation. This selection approach may not accurately capture the full spectrum of our target population, as participant selection relied heavily on availability and convenience. The study was conducted in English, which influenced the precision and accuracy of the user experience evaluation. Although basic English was a requirement for the participants, usability testing in native languages like isiXhosa could have possibly provided more detailed insights into their interaction with the application.

The remote set-up of the usability testing introduces further limitations. The inability to directly observe participants curtailed gathering insights from physical reactions and body language, critical elements in understanding the user experience. Direct, in-person testing would have furnished richer qualitative data, which could highly the user's feelings as they go through the usability exercises. Despite this limitation, the users had real-time access to the researcher, where they could indicate their frustrations or thoughts due to the synchronous approach of the usability testing process.

This study focused on agricultural stokvels, which limits the findings' applicability to other types of stokvels serving diverse purposes (Mashigo & Schoeman, 2012). It is essential to acknowledge that the investigation aimed to understand the usability and user experience of a unique mobile application prototype within a defined context. This focus gives direction for further research across different stokvel types, and the features evaluated in this study could still apply to stokvels of all kinds, thus broadening the relevance of the findings.

Descriptive statistics served as the principal quantitative method for representing data in this study, which surfaced with certain limitations. While these statistics delivered critical insights into the transition from the initial to the updated version of the application, they also highlighted the requirement for more comprehensive research for a statistically significant understanding of its usability. With only four participants

engaged for each application iteration, a larger sample size could ensure a more statistically robust outcome (Borsci et al., 2013). While the preliminary data is enlightening, an expanded sample could bolster statistical analysis and better understand the average user experience. This would allow more thorough scrutiny of data distribution and facilitate the identification of anomalies or atypical scenarios.

This study did not account for the effect of potentially confounding variables, such as participants' familiarity with similar applications, their overall technical competency, or the specific circumstances under which the testing took place (Bland & Altman, 2011). For instance, factors like domestic distractions or the testing environment could have impacted the longer completion time for participants over 40. Consequently, it would be beneficial for future research to manage these variables or include them as covariates in the analyses to better link observed differences to alterations between application versions. Similarly, the influence of family members and support systems on participants' interactions with WhatsApp and the application warrants further exploration. Previous studies underscored the significance of familial support in technology adoption and use, and understanding its impact in this context could provide valuable insights (Eynon and Helsper, 2015; Asmar et al., 2020). Although the study did not control for all potential confounding variables, acknowledging their presence indicates a comprehensive understanding of the factors influencing user experience and usability. Therefore, Future research can utilise these findings to design more controlled experiments or include these factors as covariates in their analyses. Consequently, this study represents an important stepping stone towards a more nuanced understanding of mobile application usability within the context of stokvels.

Chapter 6: Conclusion

This study aimed to investigate the potential use of a mobile application to facilitate the management of Stokvels in rural communities in South Africa. Traditional stokvels can be prone to issues such as mismanagement, lack of transparency, and fraud. The COVID-19 pandemic further highlighted the need for digital solutions as physical meetings were restricted, hindering stokvel activities and social capital building. This study sought to address these challenges and opportunities by exploring using a mobile application for Stokvel management. The objectives were to understand the functioning of stokvels in a specific rural community, examine the activities that foster social capital, design and prototype a mobile application, evaluate its usability and user experience, and gather user feedback to inform the final application's design and development. Through qualitative and quantitative analysis, this study provides insights on digital stokvel tools, financial inclusion, usability testing, and the use of mobile technologies in rural areas. A two-pronged analytical approach was executed, which encompassed a thematic analysis that illuminated the operational challenges of Stokvels, vital activities that contribute to the development of social capital and potential technological solutions. Concurrently, usability testing evaluated the efficiency, effectiveness, and user experience of the prototype application, thereby providing invaluable feedback for further optimization.

This study found that the target user group expressed critical needs for a comprehensive platform for record-keeping, improved communication channels, and an efficient loan request system. Despite the existing digital divide, participants demonstrated a readiness to adopt technology. Usability testing yielded positive results, with a 100% task completion rate in both prototype versions, indicating a solid foundational design. However, varied error rates and requests for clarification highlighted areas for improvement, which were addressed through task simplification and clarity enhancements. Participants emphasised the importance of a shared group identity, which can be reinforced through customizability and group-specific branding in the mobile application. Progress monitoring and collective goal achievement were identified as motivators for active engagement, and the application should incorporate features that allow members to track progress and celebrate milestones. Effective communication was recognised as a crucial element, and the application design

should prioritise seamless and user-friendly communication functionalities. Shared financial responsibility and mutual aid were also identified as essential factors in fostering social capital, and the application can facilitate these through transparent financial management features and mechanisms for requesting assistance and providing support. This study also contributes to the existing literature through its unique approach to prototyping, combining high-fidelity and low-fidelity elements, utilising WhatsApp's polished interface and the Wizard of Oz testing methodology. This approach provides an alternative perspective on the prototyping process.

Despite the constraints encountered in this study, such as the limited timeframe, the remote format of the testing, reliance on descriptive statistics, a relatively small sample size, and the omission of certain confounding variables and external influences, this study presents an opportunity for future research. Future investigations could encompass longitudinal studies with a broader, more diverse sample size. This research could also address multiple languages in usability testing, perform in-person evaluations, and include various types of Stokvels, thereby ensuring a more comprehensive and diverse examination. In addition, a deeper exploration could focus on developing and deploying a fully functional WhatsApp chatbot, offering insights into long-term user engagement and sustained tool effectiveness. Another aspect worth probing is the impact of voice-note based interactions within the Stokvel app, leveraging the built-in voice note functionality in WhatsApp to cater to local communication habits and preferences. However, incorporating voice notes would have introduced significant complexity, as managing and interpreting diverse accents, dialects, and background noise manually would be labour-intensive and error-prone. These challenges would require advanced prototyping capabilities beyond the scope of this study, making the voice-note feature impractical in our current framework. Finally, research could explore the potential of integrating a marketplace feature within the Stokvel mobile application. This could involve an assessment of operational feasibility, user acceptance, and potential economic implications of such an addition. Emphasis could be placed on how this marketplace might bolster existing income-generating activities, like the rearing and selling of pigs by the Stokvel, providing valuable insights into how digital platforms can bolster financial inclusion in similar communities. Thus, while acknowledging the limitations of this study, the insights derived pave the way for more extensive and diverse research in a field which has the

potential to broaden our understanding of digital financial inclusion initiatives in South Africa and beyond.

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7. Appendices

7.1 Ethics Approval

Faculty of Commerce

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30/05/2022

Rebecca Njuguna, Masharty Tembo, Melissa Densmore

Department of Information Systems

University of Cape Town

REF: REC 2022/04/005

Co-designing an ICT tool to support the operations of Indigenous

Finance Institutions in Sub-Saharan Africa

We are pleased to inform you that your ethics application has been approved. Unless otherwise specified this ethical clearance is valid until 31-Dec-2023 .

Your clearance may be renewed upon application, and incorporates amendments up to and including those captured on 30-May-2022   .

Please be aware that you need to notify the Ethics Committee immediately should any aspect of your study regarding the engagement with participants as approved in this application, change. This may include aspects such as changes to the research design, questionnaires, or choice of participants.

The ongoing ethical conduct throughout the duration of the study remains the responsibility of the principal investigator.

We wish you well for your research.

2022.05.30
20:03:12 +02'00'

Jacques Rousseau
Commerce Research Ethics Chair
University of Cape Town
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"Our Mission is to be an outstanding teaching and research university, educating for life and addressing the challenges facing our society."

7.2 Focus Group Questions

Stokvel Specific Questions

1. *How old are you?*
2. *How long have you been a member?*
3. *What is the main reason for joining the Stokvel?*
4. *Why did you choose this particular stokvel?*
5. *How do you keep up to date with Stokvel activities?*

6. *What do you like the most about your stokvel?*
7. *What challenges have you faced with keeping up to date with your Stokvel?*
8. *During the lockdowns, how did you keep up to date about stokvels?*
9. *What did you miss the most about your stokvel during a lockdown?*
10. *When you need to take a loan, how do you communicate this?*
11. *What do you do if you need to find out how much your balance is in the stokvel?*
12. *Do you ever want to know how much other people have loaned in the stokvel?*
13. *How do you usually find out?*

Social Capital Questions

1. *How do you interact with your other stokvel members?*
2. *How has the stokvel improved your life?*
3. *Do you spend time with people in the stokvel outside of meetings?*
4. *Would you say you have made friends through the stokvel?*
5. *Do you trust the people in your stokvel group with personal matters?*
6. *Have you ever received help from the stokvel members unrelated to money?*
7. *Have you helped anyone in the stokvel with anything other than lending money?*

Technology use questions

1. *What type of mobile phone do you use at the moment?*
2. *What mobile applications do you use?*
3. *Which one do you like the most and why?*
4. *What is your biggest problem with the apps you use?*
5. *How much mobile data do you use on a monthly basis?*
6. *How do you usually check if you have airtime or mobile data on your phone?*

7.3 Thematic Analysis Initial Codes

Initial Codes	Transcript Excerpts
Stokvel Operations	"We are 10 members. We have a pigs stokvel/group. We are raising pigs and then we sell at an appropriate time. We started this project in January."
Communication within group	"We call our chairperson. We call this chairperson. The chairperson calls members, and we meet here."
Impact of covid on operation	"Mhhh, covid affected us in this way: we once started this thing, then we dropped it because of covid because we couldn't meet, right. So that costed us in that way because we couldn't meet as a team."
Pre-covid operation	"The effect of covid is that when covid started, they had to stop the group because they started long before covid as the group but then when covid started they had to stop and then now they started working again last year."

Financial problems	"Our biggest challenge is money at home, do you understand? Maybe we don't have pigs for example. We still want this. Maybe we don't have pigs, one of us borrows money to buy a pig because they want to do, because they want to slaughter, you understand? Yes, we face so many financial difficulties."
Debt issues with selling	"The problem when they sell, they sell together as a group but for one person. Every time they sell, they identify a person in the group and they sell for that person and then when you sell you have to make sure that they sell to the community members. Sometimes they don't pay, the community members and then you as a group member, you have to make sure that that money is available. To give to that person even if the person hasn't paid so that's the challenge."
Market for selling pigs	"The selling aspect: if you can maybe assist us with market, a place where we can use to sell our pigs after raising them, sell and get cash, and not this thing of selling for the community on credit, and then we skip a month and collect it. We ask assistance with the market and pigs feed if you maybe can help."
Problems - Non-payment	"this thing is giving us a challenge, because for example you see if I give anyone this piece [of meat], the person must pay me. If the person doesn't pay me, that costs me."
Problems - Interest accrual	"Jah so every month they contribute R200 each member and then when you do not have the R200 you have to bring R220. They charge 20 percent interest the following month.."
Stokvel operations - Loaning	"We keep R200 here and then we loan each other the very same money."
Stokvel operations - Desire for consistency in operation	"Yha they don't want to change the way that they are dealing with the group, the contributions because they feel that's the way they need to do it."
Problems - Desire for external help	"One area in which we need help is the pigs. We want to get help with pigs. I arrived a little bit late here, I did get the part where you explain where your project is coming from or what you are, and how you can help."
Use of WhatsApp	Interpreter: Okay. Among the members of this group, is there anyone with a phone, do you have computers? Or maybe WhatsApp installed in your phone. Xhosa speaker: "I do have WhatsApp" Xhosa speaker 2: "I also have. We do WhatsApp"
Technology for group communication	"English speaker - As a group do they use…are there any specific things that they utilize as a group? I think they already said they use the phone to convey..for the chairperson to convey.."
In-person meetings as main method of communication	"Xhosa speaker 1: Mh-mh [no] when we want to disseminate something in our group, we tell the chairperson. Our chairperson summons us to a meeting."

Limited access to smartphones and WhatsApp	"Interpreter - They are saying they sometimes think about how did this come about - WhatsApp but then again think uhhm, some of them don't have WhatsApp, they can't afford to have WhatsApp."
Tech savvy relatives helping elders keep up to date with WhatsApp	"You see we are with grandmothers here? So, a grandmother cannot use technology. Maybe us people who can do those technologies we can continue using them. And then keep on having meetings, and report that, no, I saw this certain thing on WhatsApp. You, see? Then the grandmothers will tell us to discuss that thing, that "okay, answer and say""
Role of technology in managing group finances	"English speaker - An app that can do other things like managing the savings and the contributions."
Positive reception to technology-based solution	"English speaker - An app that can do other things like managing the savings and the contributions." "Xhosa speaker: That could be useful. That could be useful to us, we support it. That could really help us."
Group Identity	"They would like to see S******a, which is the name of the group when they open the App."
Progress Monitoring	"Xhosa speaker 3: that is what we wish to see. We wish to see what we want is progressing, when you are opening your phone you see here is S*******a's app. Here is S*******a going forward."
App Customization	"What colors would you like. Are there colors specifically for Siyachuma that you would like to see in the app?" Xhosa speaker1 - Red! Xhosa speaker4 - red and white. Xhosa speaker 2 - Red!

7.4 Thematic Analysis Themes

Theme	Code	Definition	Examples
Operational Dynamics	Stokvel Operations, Communication within group, Stokvel operations - Loaning, Stokvel operations - Desire for consistency in operation	How the stokvel operates, including the structure of the group, their internal communication, and their primary activities.	"We are 10 members. We have a pigs stokvel/group. We are raising pigs and then we sell at an appropriate time."; "We call our chairperson. We call this chairperson. The chairperson calls members, and we meet here."; "We keep R200 here and then we loan each other the very same money."

Pandemic Impact	Impact of covid on operation, Pre-covid operation	The effects of the Covid-19 pandemic on the stokvel's operations and their adaptation strategies.	"Mhhh, covid affected us in this way: we once started this thing, then we dropped it because of covid because we couldn't meet, right."; "The effect of covid is that when covid started, they had to stop the group because they started long before covid as the group but then when covid started they had to stop and then now they started working again last year."
Financial Management	Financial problems, Debt issues with selling, Problems - Non-payment, Problems - Interest accrual	The financial challenges the group faces, including money shortage, issues with debt and non-payment, and internal rules around financial contributions.	"Our biggest challenge is money at home, do you understand?"; "The problem when they sell, they sell together as a group but for one person."; "Jah so every month they contribute R200 each member and then when you do not have the R200 you have to bring R220."
Market Accessibility	Market for selling pigs, Problems - Desire for external help	The group's challenges with finding a reliable market for their pigs and their requests for external assistance.	"The selling aspect: if you can maybe assist us with market, a place where we can use to sell our pigs after raising them."; "One area in which we need help is the pigs. We want to get help with pigs."
Technological Affordances	Use of WhatsApp, Technology for group communication, In-person meetings as main method of communication, Limited access to smartphones and WhatsApp, Tech savvy relatives helping elders keep up to date with WhatsApp, Role of technology in managing group finances, Positive reception to technology-based solution	The group's interaction with technology, including their use of smartphones and apps, their attitudes towards technology, and their hopes for how technology might improve their operations.	"Interpreter: Okay. Among the members of this group, is there anyone with a phone, do you have computers? Or maybe WhatsApp installed in your phone."; "An app that can do other things like managing the savings and the contributions."; "That could be useful. That could be useful to us, we support it. That could really help us."
Status Monitoring and Personalizati on	Group Identity, Progress Monitoring, App Customization	The group's preferences for an app that can track their progress and is personalized to their group identity.	"They would like to see S****a, which is the name of the group when they open the App."; "that is what we wish to see. We wish to see what we want is progressing, when you are opening your phone you see here is S*****a's app. Here is S*****a"