Determinants of Mobile Commerce Adoption in Developing Countries: Evidence from Rwanda

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Summary

The rapid development of wireless technology and telecommunication networks has led to mobile devices playing an increasing role in people's lives. Businesses have recognised the value of mobile communication tools and trading platforms. A new type of technology-aided commerce – mobile commerce including mobile financial services – has gained importance in theory and practice. However, in the context of developing countries, the literature on the potential of mobile commerce and its driving factors is still limited.

Along five empirical studies conducted in Rwanda, this research identifies the factors that drive the success of mobile commerce and financial services. It defines an appropriate infrastructure (power supply and network connectivity), a suitable regulatory setting, sufficient consumer awareness, and a proper distribution network as crucial for adopting mobile commerce and harvesting its potential. Thereupon, the research derives recommendations to Rwandan policymakers and practitioners in order to achieve economic growth, reduce poverty, and enhance national welfare Rwanda.

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1 Introduction

1.1 Mobile commerce: a brief overview

Mobile commerce (henceforth m-commerce) enables financial inclusion in developing countries. It offers affordable financial services and can reach consumers unable to receive services from traditional financial institutions (Boateng et al., 2019). Researchers have used various m-commerce definitions (Wafi & Imdadullah, 2016; Zhou et al., 2010). Xin (2009) defines m-commerce as the sales and purchases of goods and services in addition to monetary transactions via mobile devices over mobile telecommunication networks. To Thakur and Srivastava (2014) and Tiwari et al. (2006) m-commerce entails any transaction initiated and completed through mobile access to computer-mediated networks that involve the transfer of ownership or rights to goods and services. Khushbu and Rajan (2016) define m-commerce as various business activities prior to and following the actual sales transaction. According to Gitau and Nzuki (2014) and Tarasewich et al. (2002), m-commerce covers all activities in the context of potential commercial transactions conducted via a wireless network using mobile devices. In the same vein, this thesis adopts a broad definition of m-commerce: activities such as purchases and transfers conducted on mobile devices providing direct or indirect commercial benefits (Leung & Antypas, 2001; Omonedo & Bocij, 2017). It may involve monetary and non-monetary transactions (Madan & Yadav, 2016; Omonedo & Bocij, 2017). Key features of m-commerce are mobility, comfort, and spontaneity, instant connectivity, ubiquity, localisation, immediacy, and simple authentication procedures (Alfahl et al., 2017; Barnes, 2002; Chong, 2013; Du & Li, 2019; Muhammad et al., 2016).

To Chong (2013) and Nauwelaerts & Chakri (2016) m-commerce is an extension of e-commerce as both concepts relate to business operations conducted via a virtual market (Loebbecke et al., 2019; Makina, 2017). In developing countries, m-commerce is more easily accessible than e-commerce (Anwar & Shah, 2020; Ashraf et al., 2017; Batista & Vicente, 2020; Norah & Altameem, 2015). Anyone with a simple mobile phone can engage in m-commerce minimizing the infrastructure problem (Chong, 2013; Norah & Altameem, 2015). M-commerce applications can be divided into directory-oriented ones and financial transaction services (International Telecom-

munication Union (ITU), 2015). Directory-oriented m-commerce involves mobile users performing read requests to a directory and providing information to mobile users (Donovan, 2012; Mbiti & Weil, 2015).

Mobile financial transactions services, the focus of this thesis, entail the transaction server receiving both read and write requests. They build a cornerstone of m-commerce (Tiwari & Buse, 2007; Rajabion, 2015). Mobile financial services can be further categorised into three partially overlapping types (Kim, 2019): mobile payment (m-payment), mobile money (m-money), and mobile banking (m-banking) (ITU, 2015; Ramakala & Rajalakshmi, 2016). *M-payments* include transactions undertaken with a remote merchant and those at the merchant site (Uwamariya & Loebbecke, 2019). In developing countries, m-payments serve person-to-person (P2P) payments and remittances, the purchase of goods, and paying utility bills (Donovan, 2012). *M-money* refers to electronic money transfers from one person to another using a mobile device. In most developing countries, there is only a thin line between m-money and m-payments (Donner & Tellez, 2008; Uwamariya & Loebbecke, 2019). *M-banking*, finally, enables users to access and manage personal bank accounts remotely using a mobile device.

1.2 Problem statement and research questions

Mobile devices have become a popular form of digital assistance in recent years (Loebbecke et al., 2020) significantly transforming how customers communicate and connect. The rapid growth of mobile devices in comparison to desktop computers (Statcounter, 2019) presents enormous profit opportunities for many businesses (Jahanshahi et al., 2011).

M-commerce may enable many disadvantaged social groups and communities to access financial services. Thereby, it may enable new business scenarios (Hinarejos et al., 2019; Pankomera & Greunen, 2019), reduce economic inequality, and drive economic growth (Heeks & Kanashiro, 2009).

On the provider side, m-commerce may improve productivity and decision-making, and thus enhance business efficiency (Perekwa et al., 2016). On the customer side, it may lead to convenient and better services (Komunte, 2015; Murphy, 2014). Overall, m-commerce it may contribute to the accumulating financial, human, and social capital (Ky et al., 2018).

Although m-commerce services continue to grow rapidly in Africa; examples include Kenya, Ghana, and Tanzania (Ahmad et al., 2020; Babatope & Mushunje, 2020; Pankomera & Greunen, 2019). In other countries such as Rwanda, Burundi, and Zimbabwe adoption rates are low (Ahmad et al., 2020; Lamptey, 2018; Tobbin, 2013; Uwamariya & Loebbecke, 2019).

The literature on m-commerce services in Africa is still limited (Bosire & Ntale, 2018; Pankomera & Greunen, 2019; Uwamariya, 2018; Uwamariya & Loebbecke, 2019). The first works address focus on Kenya, Tanzania in East-Africa as well as Cameroon and Ghana in West Africa (Abdinoor & Ulingeta, 2017; Issahaku et al., 2018; Kirui et al., 2013; Ngange & Beng, 2017). Studies into multiple perspective acceptances of mobile financial services are rare (Abdullah & Khan, 2021).

Rwanda recognizes the potential of mobile phones to reduce poverty, create an inclusive, cashless economy, and foster nationwide development (Nyataya & Ukwimanishaka, 2017). It introduced m-commerce in 2010 (Byukusenge & Munene, 2017), focussing on m-payments (also referred to as m-money in Rwanda) and m-banking (Uwizeyimana, 2019). Table 1 summarizes the main players in Rwanda's m-commerce ecosystem (Uwineza & Mulyungi, 2018).

Table 1: Players in m-commerce ecosystem in Rwanda

Players	**Roles**
Mobile network operators (MNOs)	Provide infrastructure and communications service Provide agent oversight Exercise leadership in drawing the m-commerce ecosystem together Advise other businesses (banks, utilities, etc.) on their m-commerce strategies Report suspicious transactions in accordance with Anti Money Laundering (AML) and Combating Financing in Terrorism (CFT)
Financial Institutions	Offer banking services via mobile Hold floats or accounts in customers' names Handle cross-border transactions, manage foreign exchange risk Ensure compliance with financial sector regulations
Agents	Perform cash-in and cash-out functions Handle account opening procedures, including customer due diligence
Regulators	Provide an enabling environment for m-commerce Protect stability of the financial system Demonstrate leadership to encourage and protect behaviour change
Consumers	End-user of the m-commerce products

Source: adapted from Uwineza & Mulyungi (2018, pp. 1769–1771)

In Rwanda, m-commerce services are still immature (Byukusenge & Munene, 2017; Uwamariya & Loebbecke, 2019). Only large companies have an online presence and are involved in m-commerce. Small companies, which constitute 98% of the businesses' economy (Gamba, 2019), show little commitment towards m-commerce services (Byukusenge & Munene, 2017; Odunga et al., 2019).

Few studies address country-specific features explaining m-commerce successes or failures in Rwanda (Uwamariya et al., 2021; Uwizeyimana, 2019). To fill this research gap, this thesis investigates the factors influencing m-commerce adoption in Rwanda; it focuses on mobile financial services.

To this end, the thesis poses the general research question:

"How can the adoption and use of m-commerce services be improved in Rwanda?"

To answer this question, it pursues five sub-questions corresponding to five inter-related papers that compose this thesis. The five sub-questions are:

RQ 1: How can m-payments be successful in Rwanda?

RQ 2: How and to what extent can m-banking foster the performance of microfinance institutions?

RQ 3.1: How can m-banking contribute to reducing transaction costs for MFIs in Rwanda?

RQ 3.2: How can m-banking contribute to reducing MFIs loan defaults in Rwanda?

RQ 4: What are the barriers and consequences of rolling out m-payment services to tourism SMEs in Rwanda?

RQ 5: From a domestication theory perspective, how do farmers in rural Rwanda adopt and use m-money in their everyday life?

By answering those questions, the thesis adds to the literature on the adoption of mobile financial transactions in emerging economies.

1.3 Research approach

Selecting an appropriate approach involves assessing the research environment, the research questions, and the issues known at the outset to be central to the study's progress (Creswell, 2017). In the technology adoption domain, most research pursues either a positivist or interpretive

perspective (Anderson, 2010). Creswell (2013) allocates quantitative research to a positivist paradigm and qualitative research to an interpretive paradigm. Quantitative research is primarily concerned with pre-determined variables (Yin, 2014) and the analysis concerns the relations between variables (Small, 2008). Qualitative research focusses on interpretations (Aspers & Corte, 2019). Involving primary and secondary data, qualitative research helps respond to research questions that require in-depth explanations (Smith et al., 2009) and understand more about phenomena which are challenging to communicate quantitatively (Creswell, 2017).

This research therefore, adopts a qualitative approach. Qualitative research attempts to create holistic understandings of phenomena. It uses rich, contextual, and usually unstructured, non-numeric data (Mason, 2002) and engages with research participants in natural settings (Creswell, 2013).

The study aims to understand persons in studied domains; hence, an interpretive paradigm appears to be most relevant (Myers, 2013). Interpretive research helps technology adoption researchers understand human thought and behaviours in social and organisational contexts (Klein & Myers, 1999). It allows producing deep insights into technology adoption phenomena. As m-commerce is a relatively new phenomenon, an interpretive approach is appropriate to dive deep into the different paradigms (Byukusenge & Munene, 2017; Creswell, 2013; Uwamariya & Loebbecke, 2019). The small sample sizes, here: number of interviewees still allows for a "new and richly" textured understanding (Smith et al., 2009; Vasileiou et al., 2018).

This research collects both primary data and secondary data. *Primary data* were collected via semi-structured, in-depth, face-to-face interviews, a suitable source of evidence in qualitative studies (Liamputtong, 2009; Walsham, 1995). Combining open-ended and closed questions allows for a compromise between comparability and comprehensiveness of answers. The aim was that interviewees could add their own perspective on the phenomena (King, 2004). Complementary telephone conversations clarified open ends (Oltmann, 2016). Purposive sampling allowed soliciting the participants (Creswell, 2013). To promote validity, this research used reflective listening to clarify the intended meaning of the participant (Myers, 2013) without involving the interviewer's personal view (Gorman & Clayton, 1997; Yin, 2014). Content and thematic analyses were at the core of the qualitative data analysis (Saunders et al., 2016); both are suitable when asking for adoption reasons (Altheide & Schneider, 2013; Kuckartz, 2019; Mayring, 2014).

Secondary data stem from commercial and governmental technology adoption reports and white papers (Argent et al., 2013; Bourreau & Valletti, 2015; Consultative Group to Assist the Poor, 2015; FinAccess, 2007; Kenya Communications Authority, 2015; Kenya National Bank, 2018; Rwanda Utilities Regulatory Authority, 2019).

The thesis combines theoretical approaches (Markus & Robey, 1988) into the fundamental question of why m-commerce may succeed or fail in emerging markets (Njenga et al., 2016). It adopts three theoretical underpinnings: the Technology-Organization-Environment (TOE) framework (Article 1), Transaction Costs Economics (TCE) (Article 3), and domestication theory (Article 5).

1.4 Research context

To provide an in-depth understanding of m-commerce adoption drivers and barriers, this thesis focuses on three sectors, microfinance, tourism, and agriculture. All three the Rwandan government chose as primary sectors to diversify the economy and achieve a cashless society by 2024 (Nuwagaba, 2014). The sectors are briefly described below.

1.4.1 Microfinance

Microfinance is defined as providing financial services to low-income clients – particularly consumers and entrepreneurs – who may face barriers to receive services from traditional financial institutions (Khairunisah & Fakira, 2020). Microfinance offers a variety of financial services including deposits, loans, payment services, money transfers, and insurance offerings (Alhassan & Akudugu, 2012; Idris & Agbim, 2015). It has gained popularity because it boosts income generation and self-employment – both entry points for poverty alleviation programmes benefitting the "bottom poor" (Heyzer, 1994). Microfinance loan services change women's status as they promote the well-being of the families (Akotey & Adjasi, 2016; Rani & Yadeta, 2016). However, it has been not always easy reaching the poorest members of society as their target market (Kessey, 2014). One of the biggest constraints is the high operational cost of microfinance in remote areas.

Microfinance provides a viable way of expanding financial services to poor and low-income populations (Dang & Huong, 2020). Cooperation between mobile network operators and MFIs create promising m-banking service business models. Some MFIs in Rwanda have already launched

Internet and m-banking projects across the country. However, so far achievements have been limited.

In Rwanda, MFIs provide microcredits to low-income entrepreneurs as part of their strategy to promote rural development (Mukamana, 2017). Agriculture is the key-lending sector for MFIs, accounting for 30% of MFI's loans (National Bank of Rwanda, 2019). Microcredit loans made available to villagers, impoverished women, and poor families ought to serve economically marginalised populations. Borrowers who failed to service their loans account for the many non-performing loan portfolios (Memba & Wanyoro, 2017; National Bank of Rwanda, 2019).

1.4.2 Tourism

International tourism contributes to developing efforts in many developed and developing countries (Sharpley & Telfer, 2014). Six areas that contribute to these advantages: foreign exchange earnings, creation of employment opportunities, contribution to government revenues, the stimulus to inward investment, generation of income, and regional development (Baum & Ndiuini, 2020).

An increasing number of African countries focusses on tourism as a central pillar of their economic development and reform programmes. Large destinations, such as Kenya, Tanzania, Mauritius, and Zimbabwe, have shown strong performance (Dieke, 2020).

In Rwanda, wildlife-based tourism accounts for 90% of tourism revenues (Odunga et al., 2019). The country's three principal wildlife attractions are the Volcanoes National Park, which offers gorilla tracking, the Akagera National Park with its typical Savanna experience, and the Nyungwe tropical forest, the largest remaining mountain forest in East and Central Africa. Arts and crafts within the tourism industry also offer income opportunities opening their doors to tourists for visitations and selling souvenirs. However, tourism in Rwanda is a small, undeveloped economic sector. It contributes about 0.25% to the country's economy (Odunga et al., 2019). Impediments to the Rwandan tourism industry include visitors' short durations (Kahigana, 2016), the inadequate development of infrastructure, and insufficient private sector involvement (Odunga et al., 2019).

Rwanda, like many countries, promotes the nationwide adoption of technology to counter some of those tourism challenges (Foster & Graham, 2014). The promise of technology for transforming the tourism industry is significant (Nibigira, 2014; Uwamariya et al., 2015). However, with only rudimentary use of social media, Rwanda's tourism sector lags behind other sectors in terms of harvesting the technology potential. It is therefore imperative to understand how technology services are adopted and utilized in the Rwandan tourism sector (Tan et al., 2017; Vallespin et al., 2018).

1.4.3 Agriculture

The agricultural industry is an important contributor to developing country economies, often being the main source of income, food, and employment. Rural households predominantly depend on agriculture, be it directly or indirectly, and one might expect agriculture to be a key component of growth and development given the large contribution of the sector to the overall economy. However, most African countries are yet to meet the criteria for a successful agricultural revolution, with factor productivity in African agriculture lagging far behind the rest of the world (Food and Agricultural Organization, 2018; Igudia, 2017).

Economic development is also mainly dependent on the agricultural sector in Rwanda, accounting for one-third of the national gross domestic product (National Statistics of Rwanda, 2019). Rwanda has been implementing policies and strategic plans to encourage farmers to increase land and labour productivity through improved technical inputs, with the intended outcome of enough surpluses being produced to sustain the use of inputs, thus improving farm incomes. Nevertheless, the industry still faces major challenges, among others including land constraints, limited commercialisation constrained by poor access to infrastructures and financial markets (Food and Agricultural Organization, 2018).

Previous studies have shown that approaching and adopting technological innovations are necessary elements of agricultural industry development, with technology being able to adapt to the challenges the sector faces (Ahoa et al., 2020; Koeksal & Tekinerdogan, 2019). Accordingly, digital solutions are being developed to mitigate the challenges faced by smallholder farmers and stakeholders in the value chain in Rwanda (Ubarijoro et al., 2020). However, studies into the role of technology in agriculture remain limited, despite the increasing investment made by both the

government and industry alike (Isaboke & Ukwimanishaka, 2017; Jones et al., 2021). As such, the drivers and barriers affecting the decision process with regard to adopting or rejecting innovations in agriculture and their influence on the adoption process are taken into consideration by the current research.

1.5 Research structure

Following this introductory chapter, this thesis contains five research articles, which all follow a qualitative research approach. Table 2 introduces the articles.

Table 2: Publications overview

Article	Year	Title and Authors	Empirical Setting	Publication
1	2019	Learning from the Mobile Payment Role Model: Lessons from Kenya for Neighboring Rwanda (Uwamariya & Loebbecke)	28 semi-structured expert interviews in Kenya and Rwanda	**Information Technology for Development**, 26 (1), 108-127.
2	2018	The Role of Mobile Banking in Fostering Microfinance Performance – A Case Study of Urwego Opportunity Bank in Rwanda (Uwamariya)	52 in-depth interviews with UOB*, Rwanda, staff and customers	**AIS ICIS SIG Global Development**, San Francisco, CA, USA, isle.aisnet.org/globdev2018/7.
3	2020	Mobile Banking Impacting the Performance of Microfinance Institutions: A Case Study from Rwanda (Uwamariya, Loebbecke, & Cremer)	52 in-depth interviews with UOB*, Rwanda, staff and customers	**International Journal of Innovation and Technology Management**,17(1), 1-18.
4	2021	Mobile Payment Enhancing Tourism in Emerging Markets: A Qualitative Study among Small and Medium-Sized Enterprises (SMEs) in Rwanda's Tourism Sector (Uwamariya, Loebbecke, & Cremer)	29 in-depth interviews with Rwandan adopters and non-adopters (11 tour operators, 10 ticket vendors, 8 handcraft companies)	**Journal of African Business**, 1-17, doi: 10.1080/15228916.2021.1874782.
5	2021	Mobile Money Adoption in Rural Rwanda: a domestication perspective (Uwamariya, Loebbecke, & Cremer)	81 in-depth interviews with rural farmers in the Bugesera District, Rwanda.	**Africa Journal of Management**, 7(2), 314-337, doi: 10.1080/23322373.2021.1902209.

* Urwego Opportunity Bank

Article 1: *Learning from the Mobile Payment Role Model: Lessons from Kenya for Neighboring Rwanda (Uwamariya & Loebbecke, 2019)*

This article explores the factors underpinning the success of m-payments in low-income countries, providing actionable recommendations for encouraging the adoption of m-payments in emerging markets, such as Rwanda. The focus here is on MTN's Mobile Money, Rwanda's dominant m-payment service. The article also refers to Safaricom's M-Pesa in Kenya, the regional leader in m-payments, to establish what Rwanda can learn from it. The TOE framework was selected as the theoretical foundation for conducting this research into m-payment. One widely researched factor (regulatory setting) from the original TOE framework was investigated, with seven m-payment specific factors also added: deployed Technological Standard, resources, interoperability, distribution network (agents), financial infrastructure, collaboration among stakeholders, and (sufficient) electricity. The findings highlight the need for the government of Rwanda to introduce a proper regulatory framework, ensure an adequate power supply, and foster stakeholder collaboration. The article underscores the potential of building a distribution network featuring properly incentivised agents to private players such as MTN and other Rwandan m-payment providers, especially in Rwanda's rural areas, which host 85% of the population. Such a network would help to promote the offering and usage of m-payments. Kenya has adopted a hierarchical tier structure characterised by master agents and subagents, and the article views such a potential path for the scaling-up of m-payment services in Rwanda.

Article 2*:* *The Role of Mobile Banking in Fostering Microfinance Performance – A Case Study of Urwego Opportunity Bank in Rwanda (Uwamariya, 2018)*

This qualitative study examines how MFIs can become more efficient by introducing m-banking. It uses the case study of the Urwego Opportunity Bank (UOB), a Rwandan microfinance bank that had launched m-banking. Rather than focusing on any technology adoption theory, existing literature was used to identify those practical aspects of MFI operations that were hindering their performance (Boote & Beile, 2005). To that end, data were collected on transaction costs and loan defaults – two

significant internal threats to microfinance profitability and sustainability in Rwanda. The analysis indicates that m-banking could contribute towards operational efficiencies that lower transaction costs and increase repayment rates in the Rwandan microfinance industry.

***Article 3**: Mobile Banking Impacting the Performance of Microfinance Institutions: A Case Study from Rwanda (Uwamariya, Loebbecke, & Cremer, 2020)*

To present a more robust work on the impact of m-banking on MFIs, this article revisited and extended the second article by adopting the Transaction Costs Economics (TCE) theory, which typically builds on bounded rationality assumptions and opportunistic behaviour (Schermann et al., 2016). TCE has recently gained attention in the study of technology impacts on mobile businesses (Chedrawi & Osta, 2018; Lu & Wung, 2021). We use a case study of Urwego Opportunity Bank (UOB) – Rwanda's first commercial mobile service. Overall, the case demonstrates that m-banking greatly reduces transaction costs and loan defaults, resulting in enhanced microfinance efficiency and effectiveness. However, to benefit fully from this new emerging technology, microfinance firms must improve the visibility of their agents and increase awareness campaigns of m-banking services.

***Article 4:** Mobile Payment Enhancing Tourism in Emerging Markets: A Qualitative Study among Small and Medium-Sized Enterprises (SMEs) in Rwanda's Tourism Sector (Uwamariya, Cremer, & Loebbecke, 2021)*

This exploratory article utilises a qualitative research approach to identify drivers and consequences of m-payment adoption at the customer, company, and country levels in terms of Rwandan Tourism SMEs. On the *customer level*, the findings indicate that privacy concerns have led to the unwillingness of customers to accept m-payment services. On the *company level*, the findings confirm that knowledge and skills are essential to establishing a successful m-payment market in tourism SMEs. On the *country level*, two further important factors including the high cost of internet connectivity and frequent power outages impact Rwandan tourism SMEs negatively.

***Article 5**: Mobile Money Adoption in Rural Rwanda: A Domestication Perspective (Uwamariya, Loebbecke, & Cremer, 2021)*

The research opted for domestication as a theoretical perspective to understand how rural farmers know about information technology (IT) innovation and how they acquire and integrate (or conversely fail to integrate) it into everyday practice (Chandra & Chen, 2019). The findings reveal that Rwandan farmers continuously domesticate m-money. Being informed and 'educated' about m-money by family or friends (who already use m-money) plays a vital role for farmers who contemplate adopting m-money and using m-money transfer services. Existing m-money customers with high m-money affinity can trigger m-money adoption by other farmers; they are often happy to teach farmers how to build a business relationship with frictionless financial transactions. Further, the results confirm that saving time and convenience of exchanging money with family and friends are the motivating factors for rural farmers to adopt m-payment. However, affordable electricity, high and non-transparent costs, and an inadequate agent network discourage rural farmers from adopting m-money.

The thesis concludes with two integrating chapters. Chapter 7 provides a summary and a discussion of findings followed by recommendations for practitioners and policymakers. Chapter 8, finally, offers some contributions to the academic literature gained from the research, names some limitations of the research, and concludes with some suggestions for future research.

2 Learning from the Mobile Payment Role Model: Lessons from Kenya for Neighboring Rwanda

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Learning from the mobile payment role model: lessons from Kenya for neighboring Rwanda

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ABSTRACT

Nationwide adoption of mobile payment (m-payment) has been a key driver for the socio-economic development in emerging markets. The Rwandan m-payment adoption lags behind the one in neighboring Kenya and its own ambition. This explorative study examines the factors that could enhance m-payment adoption in Rwanda. We extend the Technological, Organizational, and Environmental (TOE) framework (Tornatzky, L., & Fleischer, M. (1990). *The process of technology innovation*. Lexington, MA: Lexington Books) and apply it first to Kenya's success story of M-Pesa and then to Rwanda's main m-payment service. Based on our analysis, we determine several anchor points where Rwanda – to improve its economic situation and national welfare – could learn from M-Pesa. Further, we offer country-specific recommendations to enhance Rwanda's national welfare via m-payment adoption also among the formerly unbanked population.

KEYWORDS

ICT4D; Mobile payment; emerging markets; Rwanda; Kenya; M-Pesa; technological; organizational and environmental (TOE) framework

1. Introduction

Mobile payment (m-payment), a "financial technology" (Fin-Tech) industry, offers an alternative to the classical banking system. M-payment describes a financial transaction where at least one transaction partner uses a mobile communication device (Wenner, Joshua, Martin, Abeysekara, & Khanjan, 2017). The device allows users to perform payment transactions (Qureshi, 2013) transforming it into 'pocket-banks' (Asongu, 2013). M-payment fosters economic activities (Kayisire & Jiuchang, 2015) and brings positive returns to many stakeholders including formerly unbanked entities (Evans & Pirchio, 2015; Foster & Heeks, 2013; Nuwagaba, 2014; Wenner et al., 2017). This is particularly obvious in developing countries;[1] the most widely covered success story stems from Kenya.

Kenya, referred to as the 'Silicon Savannah,' has been the epicenter of m-payment across sub-Saharan Africa (Jack, Suri, & Townsend, 2010; Loudon, 2016; Orlikowski & Barrett, 2014). Ten years after having introduced m-payment in 2007, the country counts 31 million m-payment subscribers; Safaricom's M-Pesa alone serves 24 million customers (Safaricom, 2016). This makes Kenya the number four worldwide in m-payment services after Singapore, Canada, and the United States and clearly the number one in East Africa (Akamanzi, Deutscher, Guerich, Lobelle, & Ombaka, 2016).

Rwanda, Kenya's small, but ambitious neighbor, is trying to learn a lesson from its neighbor's success story. It is a developing country aspiring to become a middle income country and an information and communication technology (ICT) hub in the East African region by 2020 (Rwanda Ministry of Youth & ICT, 2015). Rwanda faces an underdeveloped financial infrastructure and a large unbanked population. Its national strategy with its "Smart Rwanda" agenda (Uwamariya, Cremer, & Loebbecke,

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2015) focuses on infrastructure development and private sector growth. Partially by boosting the number of active m-payment users, it aims at increasing the proportion of Rwandan adults with access to formal financial services from about 20% in 2005 to 80% by 2020 (Nuwagaba, 2014).

Table 1 summarizes the m-payment context in Kenya and Rwanda.

In the effort to learn from Kenya's m-payment success, Rwanda promotes the nationwide adoption of m-payment – even if so far only with limited achievement. With our research we aim at contributing to Rwanda's development in this issue. We investigate the factors that support m-payment adoption from various stakeholders' perspectives – mobile network operators (MNOs), banks, third-party providers, agents, and regulators (Dismas & Mutalemwa, 2014; Global System for Mobile Association, 2016; Otieno, Liyala, Odongo, & Abeka, 2016). We structure our analysis along the Technology-Organization-Environment (TOE) Framework, which has been successfully deployed in similar studies (Lu, Hu, Huang, & Tzeng, 2015; Otieno & Kahonge, 2014).

We conduct a qualitative study to gain different perspectives on problems and better understand the underpinning phenomena. To this end, we take advantage of in-depth data, which may be difficult to analyze quantitatively (Creswell, 2017). We conduct depth-semi-structured interviews to allow for the most direct, research-focused interaction between researchers and interviewees (Creswell, 2017). Based on our findings, we determine several anchor points where Rwanda could learn from Kenya's M-Pesa and offer recommendations on how to foster m-payment adoption among the large, formerly unbanked population in Rwanda.

The remainder of the paper is organized as follows: In the next sections, we present the conceptual background of our study as well as our research aims and question. We outline the factors that support m-payment adoption under the Technology-Organization-Environment (TOE) framework and provide information regarding our approach to data collection and coding. We then offer our findings – first for Kenya and then for Rwanda. Finally, we discuss our findings and conclude with concrete recommendations for strengthening the m-payment industry in low-income nations.

2. Conceptual background

The increased usage of mobile devices in many situations of our daily life has become mandatory (Shin, 2014). M-payment has become popular as an alternative mode of payment in many countries (Kang, 2014). The Government of Rwanda appreciates the potential of m-payment to foster nationwide development and reduce poverty (Nuwagaba, 2014) and to improve financial inclusion (Liebana, Ramos, & Montoro, 2015). As major part of Rwanda's demonetization move (Mwangi, Kigabo, Kihonge, & Kibachia, 2016), m-payment has become a major force for creating an inclusive cashless economy. However, the country is still at the nascent stage (Rwanda National Bank, 2017).

M-Payment research is still relatively new (Dahlberg, Guo, & Ondrus, 2015; Luna, Ramos, Montoro, & Liebana, 2016; Tiago, Manoj, Goncalo, & Campos, 2016); it mostly focuses on the success cases of Kenya and South Africa (Slade, Williams, & Dwivedi, 2013). This research on m-payment in Rwanda is the first that applies the TOE framework to study m-payment adoption factors. This helps us to specify the context – here Rwanda and other low-income nations for which the findings may prove reasonably useful (Davison & Martinsons, 2015).

Table 1. M-payment context in Kenya and Rwanda.

	Kenya	Rwanda
Population	44 mill. (Akamanzi et al., 2016)	12 mill. (Rwanda National Institute of Statistics, 2015)
Mobile phone usage (in % of population)	90% (Kenya Communications Authority, 2016)	68% (Rwanda Utilities Regulatory Authority, 2016)
M-payment subscribers (in % of population)	61% (Kenya Communications Authority, 2015)	56% (Rwanda National Bank, 2015)
Active m-payment subscribers (in % of m-payment subscribers)	87% (Safaricom, 2015)	35% (Rwanda National Bank, 2015)

3. Research aims and question

With our research, we aim at understanding the factors that drive m-payment success in low-income nations and deriving actionable recommendations for fostering m-payment adoption in emerging markets – particularly in Rwanda.

Hence, our first question is how m-payment can be successful in Rwanda. To that end, we investigate if and how Rwanda could learn from Kenya's m-payment success even though there are reasons for why it may be difficult for Rwanda to replicate the Kenyan story. Similar replication efforts in Mozambique and Tanzania have been barely successful due to different implementation environments. However, we expect to gain relevant insights that will help further adoption of m-payment in Rwanda.

4. The technology-organization-environment (TOE) framework

The literature presents several models to conduct research into the adoption of IS and IT. The most prominent ones are the Theory of Reasoned Action (Fishbein & Ajzen, 1975), the Technology Acceptance Model (Davis, 1989), the Theory of Planned Behavior (Taylor & Todd, 1995), the innovation diffusion theory (Rogers, 1995), and the Technology-Organization-Environment (TOE) framework (Tornatzky & Fleischer, 1990).

In this study, we draw on the latter for studying the implementation and adoption of technology (Ramdani, Kawalek, & Lorenzo, 2009; Raymond & Uwizeyemungu, 2007) along internal and external characteristics (Oliveira & Martins, 2011) of the organization. The TOE framework distinguishes success factors in the technological context, the organizational context, and the environmental context. It has been applied in studies on e-commerce and e-business (Ahmad, Abu-Bakar, Faziharudean, & Mohamad, 2015; Zhu & Kraemer, 2005), e-banking (Ayana, 2014; Kurnia, Peng, & Liu, 2010; Toufaily, Daghfous, & Toffoli, 2009), e-government (Sara, 2012), cloud computing (Harfoushi, Akhorshaideh, Aqqad, Al-Janini, & Obiedat, 2016), and mobile commerce (Alfahl, Sanzogni, & Houghton, 2012; Ammar & Ahmed, 2016; San, Catalan, & Ramon, 2012). Mobile commerce often shares context and features with m-payment services (Ammar & Ahmed, 2016).

We chose the TOE framework as the theoretical foundation for conducting our research in m-payment. It allows us to group factors in the research setting and to take into account the broader context in which adoption takes place. It can be extended to accept more factors and categories that help explore drivers and barriers to technology adoption (Zhu, Kraemer, & Xu, 2006); however, the TOE framework does not offer any concrete adoption factors (Ven & Verelst, 2011). A universal set of factors, suitable for any study context, does not exist (Ammar & Ahmed, 2016).

Drawing on the m-payment literature[2], we selected the specific factors from previous technology adoption studies (Wan & Ali, 2013) to deploy the TOE framework. From the original TOE framework, we investigated one widely researched factor (regulatory setting) and added seven m-payment specific factors (Tornatzky & Fleischer, 1990) – namely deployed Technological Standard, Interoperability, Resources, Distribution Network (Agents), Collaboration among Stakeholders, Financial Infrastructure, and (Sufficient) Electricity.

4.1. Technological factors

The technological context refers to available external or internal technologies (Tornatzky & Fleischer, 1990) that MNOs employ for mobile offerings. With respect to m-payment, the technological standard and the interoperability are significant (Dayadhar, 2015; International Telecommunication Union, 2013; Liu, Kauffman, & Ma, 2015; Mas & Morawczynski, 2009; Mazer & Rowan, 2016; Muthiora, 2015).

(a) *Technological Standard:* The typically deployed technological standards in developing countries are (1) Unstructured Supplementary Service Data (USSD) and (2) the SIM Application Toolkit (STK). The USSD standard works with most phones via 'quick codes'. It requires no pre-configuration on the

consumer's SIM or handset; it is integrated in most GSM networks. The STK standard of the GSM system enables the SIM to initiate actions for various financial services. It offers an app in order to communicate via SMS. Neither USSD nor STK requires an internet connection or a smartphone (Boer & de Boer, 2010; Darren, Tim, & Wheadon, 2013; Hanouch & Chen, 2015).

(b) *Interoperability:* The technological interoperability supports inter-organizational transactions among MNOs as well as between MNOs and various banks. Thus, it enables m-payment transactions with any other user via a single account (Argent, Hanson, & Gomez, 2013; Bourreau & Valletti, 2015; Mazer & Rowan, 2016; Muthiora, 2015).

4.2. Organizational factors

The organizational context describes MNO-internal resources and strategies for deploying m-payment services (Kurnia, Alzougool, Ali, & Alhashmi, 2009). The two factors vital for adopting m-payment are financial and human resources and the distribution networks with agents (Dayadhar, 2015; Dube, Chtakunye, & Chummun, 2014; Iddris, 2013; Jain, Le, Lin, & Cheng, 2011; Mas & McCaffrey, 2015; Mas & Radcliffe, 2010; Ohunmah, 2016; Otieno & Kahonge, 2014).

(a) *Resources:* Committing sufficient financial and human resources is vital for implementing an innovation (Zhu & Kraemer, 2005). M-payment providers need to invest seven to eight times the amount of generated revenue for building an agent network and generating customer awareness (Global System for Mobile Association, 2015)

(b) *Distribution Network* (Agents): Relevant aspects of this organizational factor include selecting network agents, structuring the network hierarchy, and growing the network (Camner, Pulver, & Sjoeblom, 2009; Dayadhar, 2015; Jack, Ray, & Suri, 2013; Mas & McCaffrey, 2015; Mas & Morawczynski, 2009; Wang, Wang, Lin, & Tang, 2003).

4.3. Environmental factors

It is widely acknowledged that enabling the environment promotes socially desirable outcomes (Ghobakhloo, Arias-Aranda, & Benitez-Amado, 2011; Zhu & Kraemer, 2005). We distinguish four environmental factors:

(a) *Regulatory Setting*: It determines which types of private or public institutions can offer m-payment services and outlines the business context (Liu et al., 2015). The Regulatory Setting is meant to control money laundering (Wang et al., 2003), to safeguard customer deposits (Argent et al., 2013; Jane, 2015) and accounts for aggregated funds (Mazer & Rowan, 2016; Muthiora, 2015; Ndiwalana & Popov, 2008).

(b) *Collaboration among Stakeholders:* The idea behind this factor is to coordinate the roles of various stakeholders (International Telecommunication Union, 2013) including the central bank, several ministries, public utilities, banks, and telecom regulators, MNOs, and financial service providers, so that the private sector gains the necessary confidence to invest (Mazer & Rowan, 2016; Muthiora, 2015; Ndiwalana & Popov, 2008).

(c) *Financial Infrastructure:* A minimal financial infrastructure is a prerequisite for any m-payment diffusion (World Bank, 2014a). From a minimum infrastructure level onwards, "poor quality" financial services rather foster the adoption of m-payment services, as potential users look for alternatives to the current situation (Camner et al., 2009; Mas & McCaffrey, 2015).

(d) *Sufficient Electricity:* In many developing countries, the greatest obstacle to m-payment growth is the insufficient power supply (Bilandzic, Alper, & Meyers, 2016; Gencer, 2011; Jane, 2015; Loudon, 2016). As power shortages interrupt telecom services (African Development Bank, 2014), they lead mobile phone service providers and outsourcing facilities to use off-grid power such as generators.

4.4. Summary of TOE factors

Table 2 summarizes the TOE framework factors in our study.

5. Data collection and coding

For our investigation of the Rwandan m-payment ecosystem, we focused on Rwanda's dominant m-payment service, MTN's Mobile Money. We further referred to the m-payment leader in the region, Safaricom's M-Pesa in Kenya, to see which lessons are applicable to Rwanda. Given the exploratory nature of this study, we chose a qualitative approach (Heyer & Mas, 2011; Loudon, 2016; Mokono & Manyange, 2015; Morawczynski, 2009). Data source triangulation provided the reliability and validity for our research (Creswell, 2017; Yin, 2014).

First, we reviewed secondary data from the academic literature to extract m-payment adoption issues. This helped us to better define the research context (Boote & Beile, 2005). We then studied various commercial and governmental m-payment reports and white papers (Argent et al., 2013; Bourreau & Valletti, 2015; Consultative Group to Assist the Poor, 2010, 2012, 2015; FinAccess, 2007; Jack & Suri, 2011; Kenya Communications Authority, 2015; Kenya National Bank, 2015), which allowed us to gain insights into the scope of m-payment in developing countries. Further, we investigated technological review reports, market research papers, and m-payment reports provided by the Rwandan Regulatory Authority. Finally, we analyzed case studies on m-payment market scenarios in specific regions and countries (Jane, 2015; Mbogo, 2010; Morawczynski, 2009; Nuwagaba, 2014; Orlikowski & Barrett, 2014). Based on those secondary sources, we explored the influence of the technological, organizational, or environmental factors on the adoption of m-payment.

Subsequently, we collected primary data by conducting expert interviews, which are a suitable source of evidence in qualitative case studies (Walsham, 1995). Analyzing those interviews allowed us to assess the interviewees' interpretations about m-payment-related events and actions. Before arranging for the interview partners, we evaluated the questions to alleviate the risk of influencing responses by structuring of questions or interviewers' attitudes (Patton, 2002).

We conducted 28 semi-structured expert interviews in Rwanda and Kenya. To select the interviewees, we applied purposeful sampling method, which requires one's knowledge of the field to be investigated (Patton, 2002). We chose interviewees representing various stakeholders (Au & Kauffman, 2008) with expertise in m-payments issues in Rwanda and Kenya. The interviewees encompassed top-level managers and agents from Rwanda and Kenya (Table 3). They were all familiar with m-payment methods and interested in participating in the study (Krippendorff, 2013; Patton, 2002). To get access to our interviewees, we benefitted from one author's professional experience with the

Table 2. Factors in the TOE framework.

Factor	Description / Feature
Technological	
• Technological Standard	Deployed standards in developing countries: Unstructured Supplementary Service Data (USSD) and SIM Application Toolkit (STK)
• Interoperability	Technological interoperability enabling inter-organizational transactions among MNOs as well as between MNOs and various banks
Organizational	
• Resources	Commitment to financial & human resources
• Distribution Network (Agents)	Selecting agents, structuring the network hierarchy, and growing the network
Environmental	
• Regulatory Setting	Regulations regarding market entry, cash-out process, liquidity management, and agent exclusivity
• Collaboration among Stakeholders	Third-party coordinated collaboration among the central bank, several ministries, public utilities, banks, telecom regulators, MNOs, and financial service providers
• Financial Infrastructure	Quality of the financial infrastructure before m-payment launch
• Sufficient Electricity	Strategies to provide sufficient electricity and deal with power shortages

Rwandan Utilities Regulatory Authority (RURA). The interviews took place between January and April 2016 and between December 2016 and February 2017. Interviews lasted between 30 and 90 min.

During and immediately after each interview, we took extensive field notes in order to highlight relevant information and extract valuable quotations. We used content analysis to generate and categorize items (Saunders, Lewis, & Thornhill, 2016) and paid particular attention to avoid any researcher bias as one author had been involved in Rwanda's m-payment ecosystem. By creating an initial hierarchy of categories and subcategories based on the TOE Framework, we analyzed and coded the interviews at sentence level (Guo & Bouwman, 2016).[3] Finally, in the interpretation phase, we connected the categories.

6. The success of Safaricom's M-Pesa in Kenya

6.1. Context

Kenya, a middle-income country (World Bank, 2014a), is the largest and most diversified economy in East Africa with a population of 44 million and a GDP per capita of about USD 1.200 (Akamanzi et al., 2016). Four fiber-optic cables that came into operation between 2009 and 2012 boosted Kenya's ICT revolution. In 2016, mobile penetration reached almost 90% of the population. Safaricom, Kenya's largest mobile operator, enjoys a market share of 66% (Kenya Communications Authority, 2016).

In 2007, Safaricom launched M-Pesa ("M" stands for mobile and "Pesa" means money in Swahili). It was the country's first and became its most popular m-payment service. M-Pesa allows customers to transfer and withdraw money and to pay goods and services using a mobile phone. Since its launch, M-Pesa has grown impressively (Loudon, 2016; Orlikowski & Barrett, 2014). The number of registered

Table 3. Study interviewees.

Interviewee	Stakeholder	Month/ Year	Duration (in Min.)
Kenya			
Manager	Kenya Communication Authority (former Safaricom CIO)	02/2016	60
M-Pesa Manager	Safaricom	03/2016	45
Agent "A"	Safaricom	03/2016	25
Agent "B"	Safaricom	03/2016	20
Agent "C"	Safaricom	01/2017	20
Agent "D"	Safaricom	01/2017	25
Innovation Manager	Kenya Communications Authority	02/2016	30
IT Consultant "A"	Private	02/2017	30
IT Consultant "B"	Private	02/2017	30
IT Consultant "C"	Private	02/2017	90
Rwanda			
Director General	Rwanda Utilities Reg. Authority (RURA)	01/2017	20
IT Directorate "A"	RURA	12/2017	25
IT Directorate "B"	RURA	12/2017	30
IT Manager	RURA	02/2016	50
Payment System Manager	Rwanda National Bank (RNB)	12/2017	80
ICT Directorate "A"	RNB	01/2016	30
ICT Directorate "B"	RNB	01/2016	30
Telecom Manager	East African Communic. Orga. (EACO)	04/2016	35
Executive Manager	EACO	04/2016	30
Manager "A"	EACO, Security & Innovation Directorate	03/2016	45
Manager "B"	EACO, Security & Innovation Directorate	03/2016	40
Mobile Money Manager	MTN	02/2017	50
Agent "A"	MTN	02/2017	20
Agent "B"	MTN	02/2017	20
Agent "C"	MTN	04/2016	20
Agent "D"	MTN	04/2016	25
IT Consultant "A"	Private	02/2017	30
IT Consultant "B"	Private	02/2017	40

users rose from 270,000 in 2007 to more than 22 million in 2015 (Kenya Communications Authority, 2015). The second and third largest players in the Kenyan market are Airtel Money (Airtel Networks Kenya) with 3.1 million and Mobikash (Mobicom Kenya) with 1.7 million m-payment subscribers (Loudon, 2016). Already in the third year after the launch, in 2009, M-Pesa contributed 10% to the Kenyan GDP (Mbiti & Weil, 2011); the share grew more than threefold to 31% in 2013 (Safaricom, 2014).

The M-Pesa rollout has facilitated transactions, increased financial liquidity, raised employment, and enlarged country-wide savings. With M-Pesa, Safaricom empowered women in the economy (Morawczynski, 2009; Plyler, Haas, & Nagarajan, 2010), as family members in urban areas no longer need to make overnight trips to the countryside or count on friends and public drivers to deliver payments (Fengler, 2012; Jack & Suri, 2011). It heavily contributed to a healthier macroeconomic environment, so that Kenya's Central Bank can better monitor the circulating cash (Sanja & Wasilwa, 2014). Furthermore, a platform for developing new services around M-Pesa has boosted Kenya's entrepreneurship rate and enhanced the performance of many small enterprises (Kendall, Maurer, Machoka, & Veniard, 2011; Mbogo, 2010).

6.2. Implementing and diffusing Safaricom's M-Pesa in Kenya

In this section, we present the successful implementation and diffusion of M-Pesa along the selected TOE framework factors.

6.2.1. Technological factors

(a) *Technological Standard:* M-Pesa works with the STK standard with SMS delivery. Users download the STK application over the air, store it on the SIM card, and access it via the phone menu. Safaricom controls the application and determines updates, additional downloads, and even removals. While the STK standard is more expensive for users and MNOs than the alternative USSD standard (Global System for Mobile Association, 2015), it is less vulnerable to the interception of transaction data. M-Pesa is sensitive to poor signals and automatically re-sends any transaction message in case the mobile signal has been too low (International Telecommunication Union, 2017).

> The high crime rate in Kenya created a great demand for a safe way of sending money. M-Pesa turned to the STK standard to provide end-to-end security. [Innovation Manager, Kenya Communications Authority, 2016]

(b) *Interoperability*: Safaricom is hesitant to allow for interoperability with other MNOs, as M-Pesa dominates the m-payment market. Therefore, interoperability with other MNOs is limited in Kenya.

> All MNOs need to cooperate for efficiently performing m-payment services. As it stands, Safaricom commands all terms. Why should they promote interoperability? They do not. [Manager, Kenya Communications Authority (Former Safaricom CIO) 2016]

Interoperability with banks and other financial service providers works well and meets the customer demand. As of 2016, 25 banks in the M-Pesa network covered 700 ATMs, which allow subscribers to conduct financial services without M-Pesa agents.

6.2.2. Organizational factors

(a) *Resources:* Upon an initial investment of USD 30 million into M-Pesa, Safaricom continues to finance M-Pesa's human resources and marketing efforts. As a result, the M-Pesa service brand outreaches Safaricom's corporate brand. Safaricom also supports recruiting and training agents for M-Pesa. The agents then help educate the customers to manage their cash flows effectively. Within Safaricom, experienced managers share their expertise throughout the

organization. Identified high potential employees can participate in a university Graduate Management Program to strengthen their functional and business skills.

(b) *Distribution Network (Agents)*: Safaricom started M-Pesa's distribution network with several thousand agents across the country and rapidly enforced the network density in the following years. The resulting agent network shows a hierarchical tier-structure with master agents (aggregators) and sub-agents. Safaricom transacts only with the master agents, who they monitor through bi-weekly site visits. The master agents buy large e-cash amounts from Safaricom and resell them to sub-agents in their geographical area. Sub-agents deal with the end-customers. They typically receive a share of the percentage earned on agent commissions in order to incentivize sales and transactions at the local level.

6.2.3. Environmental factors

(a) *Regulatory Setting*: Safaricom launched M-Pesa upon a simple "no objection letter" from Kenya's National Bank, the country's national regulator for m-payment providers. The letter allowed Safaricom to pilot and rollout the M-Pesa without facing regulatory constraints. Safaricom then executed a "test-and-learn" approach whereby it closely monitored new market entrants to assess and mitigate initial risks.

> Regulatory efforts in Kenya focused on the linkages between regulation and innovation. The "no objection letter" allowed Safaricom to maximize positive effects of innovation. [Manager, Kenya Communications Authority (Former Safaricom CIO) 2016]

Safaricom must deposit customer funds in one of three commercial Kenyan banks. Individuals can accumulate savings in their m-payment accounts; the savings are fully covered by bank deposits. The banks transfer the interest generated from the deposits to Safaricom, which is obliged to donate them to a charity. This process allows Safaricom to gain trust throughout the population.

Kenya forbids agent exclusivity. However, M-Pesa imposes certain rules upon their agents. For instance, it requires all agents to represent the M-Pesa brand.

> Since 2014, as M-Pesa agents we may also serve other m-payment providers, but we must bring at least 75% of signage for the M-Pesa Brand. [Agent "B," Safaricom, 2016]

(a) *Collaboration among Stakeholders:* In 2012, Kenya's government established the Centre for Research on Financial Markets and Policy, which acts as a platform for intellectual engagement. It promotes a dialog between financial market experts, the banking sector, and policy makers. Further, it sponsors research, provides consulting, and hosts conferences on key financial market issues involving scholars and practitioners. Thereby, it shapes the guidelines for financial markets and continuously provides strategic direction to the deployment of m-payment services in Kenya.

(b) *Financial Infrastructure:* The networks of branches belonging to banks and microfinance institutions had provided Kenya with rural "liquidity points" for several years (World Bank, 2014b). However, before the launch of M-Pesa, almost 60% of the largely unbanked population had transferred money "via friends and family" in spite of risks and trust issues involved (Jack & Suri, 2014). Such *a* poor financial infrastructure situation made it easy for Safaricom to outperform the (established) players and to disrupt the market with M-Pesa, which significantly reduced the high cost of transporting cash and the risk of theft.

> Kenyans used to give an envelope to a bus driver and ask him to drop it off in the town he was driving to. Sometimes they took a taxi or a bus to bring money home. Money transfer was generally expensive, slow, and insecure. M-Pesa came on time; we made it work! [M-Pesa Manager, Safaricom, 2016]

(c) *Sufficient Electricity:* About 47% of Kenyans have access to electricity (Consultative Group to Assist the Poor, 2015). To increase that percentage and to overcome power shortages, Safaricom collaborates with energy providers. Wind and solar power provide a sufficiently stable and reliable

power supply for base stations. Complementing each other, they offer unparalleled coverage and resource utilization. Diesel generators, formerly the main energy source, are kept as backups. Safaricom shares surplus energy with the local communities allowing customers to charge their mobile phones.

> The solar device provides affordable and clean energy to low income households in Kenya. They can recharge their mobile phones. This makes it possible for people to access M-Pesa. Obviously, affordable and clean energy and M-Pesa suit the needs of Kenyans; both have had important positive repercussions on peoples' lives. [M-Pesa Manager, Safaricom, 2016]

7. The case of MTN's Mobile Money in Rwanda

7.1. Context

Rwanda is a densely populated and landlocked country in East Africa of about the size of Israel. The Rwandan population amounts to more than 12 million people growing 2.6% annually; 85% of them live in rural areas. A national fiber optic backbone network links Rwanda to international sea cables and provides affordable Internet access across the country (Uwamariya et al., 2015). About 3.5 million Rwandans regularly access the Internet (Rwanda National Institute of Statistics, 2015).

Rwanda counts 8.2 million mobile phone subscribers. South African-based MTN, which has operated in Rwanda since 1998, has a 49% share of the mobile phone market. The second largest player is Tigo, launched in 2011, with 35% market share, followed by Airtel Rwanda, launched in 2013, with 16% market share (Rwanda Utilities Regulatory Authority, 2016).

In 2014, 6.7 million Rwandans subscribed to an m-payment service (Rwanda National Bank, 2015). About one third of them are active users. Pioneer MTN leads the m-payment market with a 50% market share. Their m-payment service Mobile Money lets users pay bills, transfer money to a third person or a bank account, and check bank balances. In 2015, MTN entered a partnership with Kenya's Safaricom to facilitate cross-border money transfers.

7.2. Implementing and diffusing MTN's mobile money in Rwanda

Below we investigate the implementation and diffusion of MTN's Mobile Money in Rwanda along the selected TOE framework factors.

7.2.1. Technological factors

(a) *Technology Standard*: MTN deploys the USSD standard, which works on the vast majority of mobile phones without requiring changes to SIM cards or even demanding new ones.

> USSD was a good choice. It can be installed on any mobile platform and it supports all mobile operating systems. Customers use USSD applications for various transactions such as prepaid recharge, fund transfers, bill pay, and reservations. [IT Directorate "A," Rwanda Utilities Regulatory Authority 2017]

USSD matches most customers' literacy and allows for easy updates as product offerings evolve. Revising services and supporting new ones can be done cheaply using a relatively simple coding and menu design.

> Considering the literacy rate of Rwandans, USSD is the best available standard to deliver mobile financial services in Rwanda. [Mobile Money Manager, MTN 2017]

> However, the USSD standard is particularly vulnerable to poor connections. Sessions get often interrupted when the signal is weak. Sending messages can be so slow that it takes hours for a merchant to receive a payment (International Telecommunication Union, 2017).

(a) *Interoperability:* Since 2013, the interoperability regulation of Rwanda's National Bank requires financial institutions and MNOs to be interconnected in order to allow m-payment services to reach all banked and unbanked customers. However,

> … the implementation of this regulation has lagged due to some complexity in the Rwandan m-payment market. [Payment System Manager, Rwanda National Bank 2017]

As of 2017, transactions among Rwandan MNOs are not yet possible. Customers have to manage multiple accounts to do business with everybody. MTN is concerned about losing its investment advantages and having to pay high costs for enabling interoperability.

> Interoperability is important, but will other MNOs share our investment cost? Any interoperability between MNOs is difficult. Agents need recruiting, training, and branding – all of it is costly. Of course, we want to benefit from our investments and expect to strengthen our competitive advantage when assuring interoperability […]. The National Bank should think about this when imposing interoperability. [Mobile Money Manager, MTN 2017]

7.2.2. Organizational factors

(a) *Resources:* To launch its Mobile Money, MTN initially invested USD 10 million in financial and human resources. Soon after, MTN became financially vulnerable due to competitors' price pressure, rising energy costs, and inflation. As a reaction, it reduced the original Mobile Money investment by 12%, cut the m-payment budget, and worked on improving operational efficiency.

> New actors entered the m-payment space; soon after competition became stiff; illicit transactions increased. This demands a more effective and transparent regulation through partnerships; it requires a regulatory context that benefits those providers who are hesitant to invest. [Manager "B," EACO 2016]

In Rwanda, MTN does not provide any training to agents, neither before nor during their MTN engagements. However, every year the company sends at least ten employees to training programs abroad.

> I do not receive any training related to this business; my friends taught me how to do it. [Agent "B," MTN 2017]

(a) *Distribution Network (Agents):* MTN positions so-called "retailers" between itself and its agents. Those retailers are responsible for recruiting new agents and managing their float. They receive a bonus for each recruited agent and a percentage of the commissions earned by that agent. MTN must not bind agents exclusively. They receive commissions for selling MTN's airtime and Mobile Money. Higher commissions on airtime encourage them to concentrate on airtime sales.

> I also sell Mobile Money, but my core business is airtime. Mobile Money provides me with a small extra at the end of the month. [Agent "A," MTN 2017]

The existing agent network coverage does not sufficiently serve all potential customers. Providers concentrate on urban areas, which promise quicker returns on their investments.

> Just possessing the best or coolest technology is not sufficient. We need a critical mass of reliable agents to reach a critical mass of customers, particularly in rural areas. [IT Directorate "B," Rwanda Utilities Regulatory Authority 2017]

7.2.3. Environmental factors

(a) *Regulatory Setting:* MTN started Mobile Money upon a "no objection letter" from Rwanda's National Bank. They are bound to two rather low-level regulatory requirements. First, MTN has

to deposit at least RWF 200 million (USD 239,000) at the National Bank to protect aggregated deposits. Secondly, MTN must secure customer funds in local currency in licensed banks. However, there are no further restrictions on where to invest deposits or how to use interest gained from them.

> As we cannot access those interests, we have huge amounts of untapped money in the banks that neither our clients nor MTN can take advantage of it. We sent an official request to the National Bank to clarify the matter, but have not yet obtained any answer. [Mobile Money Manager, MTN 2017]

In monthly reports to Rwanda's National Bank; MTN must disclose their transaction amounts, the number of registered agents, and trust account balances. However, penalties in the case of fraud or other issues are moderate. MNOs may share agents, but it rarely happens.

(a) *Collaboration among Stakeholders*: As different stakeholders have different expectations, motivations, and capabilities, collaboration among stakeholders is neither institutionalized nor imposed.

> We need a strategy to coordinate efforts with the main stakeholders. The national bank should facilitate such coordination, define responsibilities among stakeholders, and prioritize targets. This would promote a more effective and efficient adoption of m-payment services and it would significantly contribute to financial inclusion. [Director General, Rwanda Utilities Regulatory Authority 2017]

(b) *Financial Infrastructure*: Prior to the launch of MTN's Mobile Money, the banking system in Rwanda counted only 0.56 bank branches per 100,000 inhabitants (World Bank, 2014b). Only 14% of Rwandans had access to formal banking services (World Bank, 2014a). The unbanked population – mostly farmers and traders, who worked in big cities – had only limited means for financial transactions. To meet their financial needs, they used easily accessible, informal mechanisms even if those were risky and expensive. Introducing Mobile Money made transfers rather quick and frequent (Rwanda Ministry of Youth & ICT, 2015), although there are only few MTN centers, which are primarily located in major urban areas. The poor financial infrastructure limits the adoption of Mobile Money. It is still challenging for many retailers and agents to manage liquidity.

> Particularly in rural areas, it is difficult to find an MTN agent with sufficient money to serve all those who want to withdraw money. That is why MTN agents encourage customers to withdraw only small amounts from their accounts so that they can serve many people and optimize their profit. [IT Consultant "A," Private 2017]

(c) *Sufficient Electricity*: Only 25% of Rwandans have access to electricity – 2% off-grid, 23% on-grid (United States Agency for International Development, 2017). To tackle the shortage, Rwanda deploys complementary off-grid solar services. They are cheaper than on-grid alternatives, but still expensive considering the local purchasing power.

> Solar energy does not offer an automatic solution for diffusing m-payment, but it helps. Many Rwandans have risen above the poverty line with an estimated income of two to ten US dollars per day. Unfortunately, they still can barely afford a solar panel which alone costs around USD 300. [IT Consultant "B," Private 2017]

Most m-payment customers in rural areas take advantage of neighborhood vendors with electricity or access to a power generator. They can charge their mobile phones in their little shops as a value-added service. A single charge is relatively expensive; in rural Rwanda, it costs twice as much as a phone call (about USD 0.4).

> Often, power cuts make the mobile connection instable. Even if the system comes back quickly, we always lose customers because of that. […] Unfortunately, providing electricity throughout the country seems highly unlikely in the near future. Of course, the power supply has become better over the last decade, but it still has to improve a lot before we can have a good national m-payment environment. [Agent "D," MTN 2016]

Investing in mini power grids could help to deal with the existing gap of on-grid power.

> Telecommunication companies need stable power supply. Even a short power outage causes chaos for individuals, organizations, and businesses. We need alternatives – particularly in rural areas … The investment in off-grid power could help. [Manager "A," EACO 2016]

8. Discussion

To start our discussion, Table 4 summarizes the main similarities and differences regarding the factors driving m-payment adoption in Kenya and in Rwanda.

8.1. Technological factors

While M-Pesa works well with the STK standard, Mobile Money in Rwanda has deployed the USSD standard. As no *technological standard* clearly outperforms the other (Consultative Group to Assist the Poor, 2015; International Telecommunication Union, 2017; World Bank, 2014b), Rwanda's choice for the USSD standard does not seem to make any major difference.

The issue of *interoperability* among MNOs is still unsolved in Kenya and in Rwanda. Agent interoperability, i.e. allowing agents to serve customers from different providers, remains largely untested in both countries. In Kenya, even interoperability between MNOs and banks works reasonably well. In Rwanda, however, customers can only send money to a bank account or an m-payment account offered by the same provider. The lack of interoperability among m-payment providers appears to be a prime bottleneck for Rwanda's m-payment adoption (Global System for Mobile Association, 2016; International Telecommunication Union, 2017; Sujata, Perumal, Zaman, & Anshuman, 2017), Market leader MTN is reluctant to improve interoperability between its Mobile Money and other m-payment services as it does not want customers to switch providers. Without interoperability, operators suffer from sunk costs for infrastructure. Agents have to maintain redundant infrastructure for each service provider they wish to serve (Mas, 2011).

8.2. Organizational factors

In Kenya and in Rwanda, mobile payment providers belong to global players with sufficient access to financial and human *resources*. However, Rwanda's regulatory setting with occasional changes to the legal and business contexts seems to have discouraged international organizations to invest in the country's m-payment system (Karlene & Upkar, 2014).

Growing the *distribution network (agents)* is a major challenge, but crucial for early m-payment adoption (Jain et al., 2011; Mas & McCaffrey, 2015). In Kenya, Safaricom's hierarchical agent network strongly contributes to the success of M-Pesa. It promotes the case for an aggregator model in the absence of traditional banking (Kapoor & Mahn, 2013). Safaricom's retail agents usually have sufficient operational capital to meet customer requests for cash withdrawals and deposits. The incentive structure at the core of the model helps the m-payment adoption (Dismas & Mutalemwa, 2014). Aggregators receive a sign-up commission after a newly gained agent has conducted a minimum amount of transaction value or signed up a certain number of customers. The system thereby rewards aggregators for signing up "good" agents who actively serve customers and at the same time allows Safaricom to manage M-Pesa's distribution network. In contrast, in Rwanda MTN barely controls its distribution network. Agents often do not have access to sufficient funds and customers suffer from inadequate cash to serve them. As a result, the system cannot grow adequately.

8.3. Environmental factors

The *regulatory setting* imposes rules regarding the earned interest and limits market entry. In Kenya, Safaricom has to donate interest earned with M-Pesa security deposits to a charity; this is in line with

Table 4. Comparing M-Pesa (Kenya) and Mobile Money (Rwanda) along the TOE Framework Factors.

Factor	M-Pesa (Kenya)	Mobile Money (Rwanda)
Technological		
Technology Standard	Sim Application Toolkit (STK).	Unstructured Supplementary Service Data (USSD).
Interoperability	No transactions among MNOs. Almost unlimited transactions between MNOs and banks.	No transactions among MNOs. Limited transactions between MNOs and banks.
Organizational		
Resources	USD 30 mill. initial investment	USD 10 mill. initial investment
Distribution Network (Agents)	Safaricom selecting agents and building hierarchical structure for growing the network. Safaricom offering their agents training. Safaricom monitoring their agents through site visits every other week. Hardly any agent sharing among MNOs.	MTN with barely satisfactory agent network (agents mainly in urban areas and frequently without sufficient cash). MTN offering agents no training. MTN not running any monitoring system. Hardly any agent sharing among MNOs.
Environmental		
Regulatory Setting	2007: "No objection letter" for launching M-Pesa. Permanent regulatory framework on interest earned from deposit.	2009: "No objection letter" for launching Mobile Money. No permanent regulatory framework on interest earned from deposit.
Collaboration among Stakeholders	Governmentally launched platform encouraging collaboration among participants.	No institutionalized or publicly encouraged collaboration.
Financial Infrastructure	Sufficient rural liquidity points due to branches of various banks and microfinance institutions.	Large unbanked population throughout the country without liquidity points.
Sufficient Electricity	Extended coverage thanks to collaboration with energy providers.	Frequent power outage. Limited collaboration with energy providers.

the International Telecommunication Union (2017), which insists on returning interest to users. In Rwanda, there is no comparable regulation. MNOs and their agents can keep the interest gained from m-payment services. While Kenya imposes some limitations regarding market entry, in Rwanda there is no such rule. In addition to MTN, some banks also offer m-payment operations as independent services providers, and other financial institutions such as Urwego Opportunity and Vision Finance exploit the m-payment twin pillars of technology and distribution.

The lessons from Kenya's M-Pesa clearly speak for 'more' regulation. Rwanda's early 'test-and-learn' approach to find the best regulatory setting was not successful – neither in securing investments, nor in protecting consumers. Instead, it contributed to frequent fraudulent operations, theft, and misuse of sensitive personal information – all of which raise mistrust and limit investments (Argent et al., 2013; Donovan, 2012).

The literature supports both, a stricter (Kenya) and a looser (Rwanda) regulatory setting. According to Prieger (2002), m-payment services have not succeeded in countries with relatively strict regulation. However, the Global System for Mobile Association (2016) and Donovan (2012) demand a transparent and formalized m-payment regulatory framework. Hence we would expect that also in Rwanda stricter regulation would encourage sustainable competition and innovation in the m-payment ecosystem, attract investments, increase operational efficiency, and accelerate financial inclusion (Adler, 2012; Global System for Mobile Association, 2016).

Regarding the *collaboration among stakeholders*, Kenya actively fosters such collaboration. Rwanda still lacks a suitable common platform that coordinates among MNOs, payment processors, private enterprises, government departments, and the regulatory agency. Active coordination by a third party could incentivize adhering to common risk management practices. Hand in hand with the regulatory framework, organized collaboration among stakeholders could secure competition while avoiding a dominant player who controls important resources and exerts market power (Iansiti & Levien, 2004; Selander, Henfridsson, & Svahn, 2013). Thereby such a platform could promote jointly developing and deploying innovative applications and technologies (Hedman & Henningsson, 2015; Miao & Jayakar, 2013).

Finally, *sufficient electricity* is a major concern in most developing countries (Apulu & Latham, 2009). Kenya's Safaricom has aggressively developed and strengthened the rural energy market in order to keep its customers engaged and increase M-Pesa uptake (Kariuki, 2015). The national authorities back Safaricom and build on standalone renewable technology with affordable mini-grids. Such an approach could serve as a role model. In Rwanda, we find no similar action plan. Many Rwandan villages are not yet connected to the nation's electricity grid. People visit friends with generators or search for any other mini-grid solution in order to charge their mobile phones.

9. Conclusion and way forward

Based on insights from M-Pesa in Kenya, we have shed light on how to successfully roll out m-payment in a developing nation such as Rwanda with this study. Having investigated eight factors along the TOE Framework, we see the strongest action potential in restructuring the distribution network and in reshaping the regulatory setting in Rwanda (Tornatzky & Fleischer, 1990), and hence provide four main recommendations for Rwandan stakeholders:

(1) *Change the structure of the distribution network*: we put forward building a distribution network of properly incentivized agents. We believe that an aggregator model as adopted in Kenya could help Rwanda to serve the country's rural areas with 85% of Rwanda's population who are otherwise disconnected.
(2) *Develop more effective regulation:* we emphasize the need for Rwanda's government to develop effective legal and regulatory frameworks as basis for a scalable m-payment services throughout the country.
(3) *Provide third party coordination among stakeholders:* we suggest putting in place a formal coordination mechanism in Rwanda; it would help keeping up with the pace of technological innovation and market changes.
(4) *Undertake maximum efforts to secure sufficient power supply*: we believe that progress concerning the availability of electricity is needed and feasible if service providers integrate standalone renewable technology and affordable mini-grids into their efforts to strengthen power supply and provide energy access points.

Based on our in-depth explorative analysis, we are convinced that Rwanda, as almost any emerging market, will benefit from the potential of new ICT infrastructure and m-payment services when pursuing those recommendations.

10. Implications and future research

For scholars, practitioners and policy makers, the implications of these findings are manifold. Firstly, we extended the TOE Framework and thus contributed towards knowledge on technology adoption in emerging markets. Secondly, we outlined strategies for stakeholders in Rwanda and comparable contexts to foster m-payment adoption. Increased m-payment adoption in Rwanda should yield economic benefits such as new jobs, a more diversified portfolio of economic activities, and ultimately improve the nation's economic and societal development and its national welfare (Guo & Bouwman, 2016).

In future research, one may want to dig deeper into Rwandan stakeholders, and investigate especially the agents' and end-users' economic concerns. Further, several cross-country analyses could provide detailed empirical evidence on the characteristics of both successful and unsuccessful m-payment initiatives and assist national and multinational corporations as well as governments to better customize their efforts and strategies (Rajabion, 2015).

Notes

1. In Mozambique, m-payment increased savings and transactions (Catia & Pedro, 2012). In Niger, it reduced the transaction costs while increasing consumer flexibility and privacy (Aker, Boumnijel, McClelland, & Tierney, 2013). In rural Cambodia, m-payment brought benefits of time, security and convenience especially for micro-entrepreneurs (Vong, Fang, & Insu, 2012).
2. E.g. Argent et al., 2013; Boer & de Boer, 2010; Camner et al., 2009; Darren et al., 2013; Dayadhar, 2015; Evans & Pirchio, 2015; Heyer & Mas, 2011; Hughes & Lonie, 2007; Jack & Suri, 2011; Jack & Suri, 2014; Jane, 2015; Luarn & Lin, 2005; Mas & Radcliffe, 2010; Munyegera & Matsumoto, 2016; Muthiora, 2015; Ndiwalana & Popov, 2008; Otieno & Kahonge, 2014; Schierz, Schilke, & Wirtz, 2010; Slade, Williams, Yogesh, & Niall, 2015; Wang et al., 2003.
3. The coding table was included in the review and is available to the readers upon request.

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3 The Role of Mobile Banking in Fostering Microfinance Performance – A Case Study of Urwego Opportunity Bank in Rwanda

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The Role of Mobile Banking in Fostering Microfinance Performance – A Case Study of Urwego Opportunity Bank in Rwanda

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ABSTRACT

Microfinance Institutions (MFIs) can potentially alleviate poverty across the world. To achieve this, they must first resolve problems with their existing operational models. In Rwanda, these are the high costs and loan default risks that threaten microfinance's profitability and sustainability. Information and Communication Technologies (ICTs), particularly mobile banking (m-banking), may offer solutions. Some MFIs in Rwanda had already tried to capitalize on these technologies by launching m-banking projects in small-scale experiments across the country. These initiatives have had limited success. This qualitative study examines how MFIs could use m-banking more effectively to achieve business efficiencies. The case study it uses is the Urwego Opportunity Bank (UOB), a Rwandan microfinance bank that had launched m-banking. The analysis uses existing literature to identify the practical issues hindering microfinance institution performance, namely transaction costs and loan defaults.

From the consumer perspective, the study demonstrated that m-banking saves existing customers time. It also reduces the problem of theft, as they no longer need to travel with cash for loan repayment. From the institution's perspective, the analysis indicates that the adoption of m-banking creates operational efficiencies. This lowers transaction costs and facilitates higher repayment rates for microfinance.

1. Introduction

The government of Rwanda wants to promote savings investment cycles that lead to economic development (Tumwine et al., 2015). It also recognises the role that Microfinance Institutions (MFIs) could play in this. As a result, the government has undertaken several initiatives and reforms to boost financial inclusion by developing a microfinance sector.

Microfinance is a financial service for poor or low-income clients, including consumers and entrepreneurs who would otherwise not be served by traditional financial institutions (Agnihotri, 2013).

Most of the MFIs in Rwanda do not reach out to poor people because of the high operational costs involved (Tumwine et al., 2015) and a high rate of loan defaults (Maharana, 2014). Rwanda still has a large population without bank accounts, otherwise referred to as the 'unbanked' (Consultative Group to Assist the Poor, 2015). Only 38.4% of the country's population is served by formal financial sectors (Consultative Group to Assist the Poor, 2015).

The rollout of ICT-enabled microfinance services represents a paradigm shift for the sector (Sabyasachi, 2009). Mobile phones could be an alternative channel for delivering financial services to less advantaged and unbanked people without a traditional bank account (Afshan and Sharif, 2016). With m-banking, MFIs can provide more efficient loan and monitoring services than traditional cash-based systems (Wamai and Kandiri, 2015). Such a system could improve operational efficiencies and enable sustainable outreach to underserved populations (Afshan and Sharif, 2016).

In Rwanda, however, m-banking technology is still in its infancy (Harelimana, 2018; Nuwagaba, 2014). Most of the MFIs in Rwanda are still operating through traditional channels and have not managed to reduce their operating costs (Harelimana, 2018). This makes them dependent on donors and hence unsustainable (Tumwine et al., 2015).

This study's main objective is to determine how m-banking could enhance the performance of microfinance in Rwanda. It aims to provide practical recommendations on how to solve existing challenges and increase sustainability for microfinance through m-banking. The study responded to the following research questions: *How and to what extent can m-banking foster the performance of microfinance institutions?*

The rest of the paper is organised as follows. Section 2 briefly overviews the literature related to this article. Section 3 outlines the method used to respond to our research question. Section 4 offers the main case findings followed by finding discussions in section 5. Finally, section 6 concludes by summarising our contribution and suggesting some directions for future research.

2. A Literature brief

2.1. Microfinance

Globally, microfinance has shown promise of providing financial services for the poor. In most developing countries, microfinance has had a positive impact on income-generating activities, improvement in education, access to financial services, better health services, and poverty alleviation, (Armendariz and Morduch, 2010; Bond and Rai, 2009). Bourlès and Cozarenco (2014) says that microfinance is the provision of financial services to low-income poor and very poor self-employed people. Schreiner and Colombet, (2001) on the other hand define microfinance as the attempt to improve access to small deposits and small loans for poor households neglected by banks. Because of this ability, microfinance could reduce poverty and enhance economic development by providing credit and savings services to those people earning low incomes (Ivatury and Pickens, 2006). There is general agreement in economics that microfinancing alleviates economic development (Hassan and Bauer, 2013). The money or funds that are provided by microfinance institutions, in terms of credit and microloans, enable those who are poor to invest in productive activities that are bound to earn them income. This helps them boost their economic status; alleviating poverty in the entire economy (Hassan and Bauer, 2013). Microfinance institutions, therefore, are an opportunity for sustainable development (Hinson, 2011).

Rwanda's microfinance industry deserves particular attention since it is crucial for the economy's vitality. If its effects are positive, it will be able to contribute a lot to the socio-economic development of the country (Hudon and Meyer, 2016). However, the industry faces similar challenges across other African countries (Harelimana, 2017). None-performing loan rates and limited institutional capacity in management are problematic in Rwandan's MFIs (Harelimana, 2018). Many MFIs are not reducing transaction costs or offering better products and services that meet clients' needs (Gasheja and Harelimana, 2016).

The Government of Rwanda believes that m-banking will allow microfinance to reach the 'unbanked' (Gasheja and Harelimana, 2016). The Government, through the Rwanda Development Board (RDB), has laid fibre-optic networks at most financial institution's headquarters to facilitate mobile financial services. Nevertheless, the uptake of m-banking in Rwanda remains low and did make the progress anticipated (Gasheja and Harelimana, 2016). Rwanda's microfinance operations are still cash-based (Isaboke and Ukwimanishaka, 2017). Only two MFIs are offering m-banking services and Internet banking (National Bank of Rwanda, 2015). The others still rely on their traditional manual processing systems, which are inefficient and result in poor performance (Parikh, 2005).

2.2. Transaction Costs in Microfinance

The primary objective of MFI leaders is to make microfinance operations profitable and sustainable (Baland et al., 2013). Unlike commercial banks with larger loans and a long maturity, most of the poor people served by microfinance require small loans with shorter maturity. These types of loans are expensive to administer and involve high follow-up costs as well as high defaults, which results in high transaction costs (Brandt et al., 2009).

Transaction cost refers to the costs of search, information, bargaining, decision-making, policy, and enforcement (Nalukenge, 2003). Within microfinance specifically, transaction costs consist of three components: group formation costs, costs of direct administrative activities, and costs of monitoring (Sudhir et al., 2017). The formation costs come from integrating group members into credit systems so that they can receive credit (Sudhir et al., 2017). They are associated with the formation and training of groups who will receive loans (Sudhir et al., 2017). The costs of direct administrative activities relate to appraisal, documentation, disbursements, and other direct activities related to administration (Dehem and Hudon, 2013). Monitoring costs refer to the costs associated with loan utilisation checks and installment collections (Bazinzi et al., 2013). In relation to customers, transaction costs are the costs paid by borrowers while seeking the services of MFIs (Martha and Neha, 2013). They may include the time borrowers have to spend away from their businesses, their transportation expenses, and other costs for receiving loan funds (Nalukenge, 2003).

2.3. Loan Defaults in Microfinance

Microfinance offers an increasingly important source of credit for the poor in many countries. The weekly collection of repayment installments is a key feature of microfinance believed to reduce default risk in the absence of collateral (Hadi and Kamaluddin, 2015). This makes lending to the poor viable (Godquin, 2004). Loan default is the single biggest threat to microfinance profitability and sustainability globally (Kodongo and Kendi, 2013). Loan default in microfinance operations is a significant problem because it undermines the dual objectives of staying viable and serving the poor population (Ibtissem and Bouri, 2013).

Scholars have given several convergent definitions of loan default. A debtor that is only late on a single payment would technically be classed as holding a delinquent loan (Siaw et al., 2014). According to Boateng, and Oduro (2018), a delinquent loan becomes a defaulted loan when the chance of loan recovery becomes minimal. In the view of Boateng (2015) default occurs when a debtor has not met his or her legal obligations laid out by the debt contract. Loan default is when you fall behind with your monthly repayments (Siaw et al., 2014). Accordingly, this research

follows the Consultative Group to Assist the Poor (2010) by defining a loan as defaulted when the customer does not pay back the loan and the creditor does not expect that it will be repaid.

Previous studies have analysed the causes of loan defaults in microfinance. A study conducted by Wongnaa and Awunyo-Vitor, (2013) showed that loan defaults within MFIs are caused by improper client assessment, collateral assessment, and poor loan history. Similarly, in the study conducted by Adem et al. (2012), loan defaults happen when credit risk is not properly identified and when companies are paying high taxes. Gatimu and Frederick (2014) state that the main causes of loan default in microfinance institutions are the borrower's history, the borrower's willingness to pay back, diversion of funds, negligence, and, in some cases, incorrect appraisal by the loan officers. Poor borrowers, according to Bayang (2009), are preoccupied with pressing economic difficulties, such as food shortage, lack of seeds for planting and medical bills, that make repayment of microfinance loans difficult.

3. Methods

Given the exploratory nature of this study, I opted for a qualitative approach for a depth investigation (Creswell, 2017) of m-banking adoption by microfinance in Rwanda. The interpretive paradigm appears most appropriate to understand factors that influence m-banking adoption in microfinance. This is because the researcher is trying to determine how m-banking can be adopted and used in microfinance operations without manipulating any variables (Orlikowski and Barrett, 2014; Walsham, 2006).

The study uses a single exploratory case study design to gain a thorough understanding of the real value of m-banking for costs reduction and loan defaults. Qualitative research uses a single exploratory case approach when the research question requires an in-depth understanding of a single case rather than a broad understanding of several cases (De Massis and Kotlar, 2014; Myers, 2009). The study focuses on the "Urwego Opportunity Bank" (UOB) that provides microfinance services in Rwanda. UOB was selected because it was the first accredited MFI in Rwanda with operations, including mobile-based transactions.

Rather than focusing on any technology adoption theory (Mookherjee and Motta, 2016), this study has looked at two practical aspects of MFI operations that hinder performance (Boote and Beile, 2005). Accordingly, data was collected on transaction costs and loan defaults. The literature identifies these as the biggest internal threats to microfinance profitability and sustainability in Rwanda (National Bank of Rwanda, 2015). Although other factors may affect performance, these are the two major performance indicators of MFIs (Angelucci et al., 2015; Donner and Tellez, 2008; Sudhir et al., 2017; Welderufael et al., 2015).

This study draws for both secondary and primary data. For the secondary data, academic literature was used to extract m-banking adoption issues and gain insights into the scope of m-banking in developing countries. Further, it explores different UOB´s reports (e.g. annual reports, weekly and monthly loan monitoring reports, financial reports, and training reports) available at the bank's head office. Other documents and websites from different stakeholders (e.g. Rwanda Ministry of Finance, National Bank of Rwanda, mVisa Rwanda, MTN Rwanda) were also included to better define the research context (Boote and Beile, 2005).

Primary data was collected through in-depth interviews (n=52) with UOB staff including top managers at its head office, branch managers, loan officers, as well as UOB's customers (Table 1). A purposeful sampling method was applied to select key informants at UOB level (n=10) and among customers (n=42). Participant selection methods were guided by the expectation that each participant will provide unique and rich information that is valuable to this research (Etikan, 2016). All respondents were familiar with UOB's m-banking system and were interested in participating in this study (Krippendorff, 2013; Patton, 2002). I used contacts from my previous work experience in the Rwandan microfinance industry to open the lines of communication necessary for data collection. The study site was at Kigali. This is where UOB's m-banking was initiated and where the project's main architectural ground is located.

The questions were open-ended and respondents were encouraged to express their own points of view during the interview. I had prepared talking points to facilitate the conversation with respondents. Despite this, I did not follow the same sequence consistently throughout the interviews as the progress of the conversation was dependent on participant responses (Myers, 2013). In the first part of the questions, participants were asked to describe their experience and qualifications. The focus of the second set of questions was to describe current practices, operations, services, and products associated with m-banking. The third set of questions was the most detailed of the interview as it laid out how m-banking could reduce transaction costs and improve loan repayments. During the final set of questions, the participants had the opportunity to extend the collaborative exchange by suggesting elements that would improve m-banking implementation in the microfinance industry.

The interviews took place between June and August 2018. Each interview lasted between 30 and 90 minutes. During and immediately after each interview, I took extensive field notes in order to highlight important and valuable information and to extract relevant quotations. I applied a content analysis technique (Saunders et al., 2016) to conduct data analysis. I reviewed the roles m-banking plays for both institutional and customers' performance.

Table 1. Study Interviewees (N= 52)

Position	N	Location	Duration (in Min.)
IT management	1	UOB head office	30 min
Service Delivery management	1	UOB head office	90 min
Branch manager	1	Gisozi Branch	60 min
Branch manager	1	Kimironko Branch	45 min
Branch manager	1	Kicukiro Branch	60 min
Loan officer	2	Gisozi Branch	30 min
Loan officer	2	Kimironko Branch	45 min
Loan officer	1	Kicukiro Branch	50 min
Customers	14	Gisozi Branch	75 min
Customers	15	Kimironko Branch	90 min
Customers	13	Kicukiro Branch	45 min

Following transaction costs and loan defaults aspects; the interview transcripts were read repeatedly to identify recurrent themes that arose from different interviews. The themes were then grouped into subthemes, from which I extracted relevant quotations. I paid attention to my own biases because I was involved in Rwanda's technology implementation of ICT in microfinance sector (Patton, 2002). To protect the anonymity of the respondent's statements, alphabet codes (A, B, C) have been assigned to UOB branches.

4. Implementing and Diffusing UOB's M-Banking

4.1. Case overview

The word "urwego" means "ladder". Its inclusion in the bank's name suggests its commitment to lift communities out of poverty. Urwego Community Bank merged with Opportunity International Bank in 2007 to become Urwego Opportunity Bank–UOB. The UOB has 18 branches located in 11 districts throughout Rwanda (UOB, 2018). Loan lending and recovery make up 90% of UOB's activities. UOB mainly grants group loans. This is where a group of several customers represents a single client (Kodongo and Kendi, 2013). There are about thirty members in each group. The bank also offers individual loans to certain customers who are not part of a loan group but who have been loyal to the bank.

In 2012, UOB was approached by Visa to explore collaboration on m-banking offering after UOB was an unsuccessful attempt to partner with MTN Rwanda. Visa completed an m-banking pilot project with 157 UOB customers end of 2012. The success of Visa led UOB to expand the project and roll out m-banking on a larger scale. The bank introduced the new system called m-Hose, where 'm' stands for mobile and 'Hose' means everywhere in the local language. UOB launched officially m-Hose operations in Rwanda in 2013. To date, it has a total of 45,000 users. Through

this system, customers can take advantage of a wide range of m-banking services via their cell phones (Figure1). With m-Hose, UOB offers a multitude of services but loan repayment is the most used today, accounting for 90% of all services (UOB, 2018). UOB has developed its own agent network, which allows its customers to make cash deposits and withdrawals from their m-Hose accounts. The system now has 110 active agents (UOB, 2018). Each client and agent receives an identification code, which, when combined with their phone number, becomes their personal identification for transacting on the m-Hose system (UOB, 2018).

4.2. The Value of m-Hose on Transaction Costs

Provider Perspectives

A. Group formation and training costs. M-banking helps UOB loan officers work more productively while reducing overall customer training costs. Though m-Hose (m-banking), UOB's loan officers are able to spend less time with cash collections and have more time for the group or to attend more meetings.

> *The effectiveness of staff increases when payments are made and tracked electronically. With m-Hose, loan officers can now arrive to train and organize more groups than before.* (Branch " A" , Manager, 2018)

> *Rather than focusing on cash collection, now they discuss loan defaults. They spend time informing our customers about our new products and helping with any questions that have come up in the meeting.* (Branch "C", Manager, 2018)

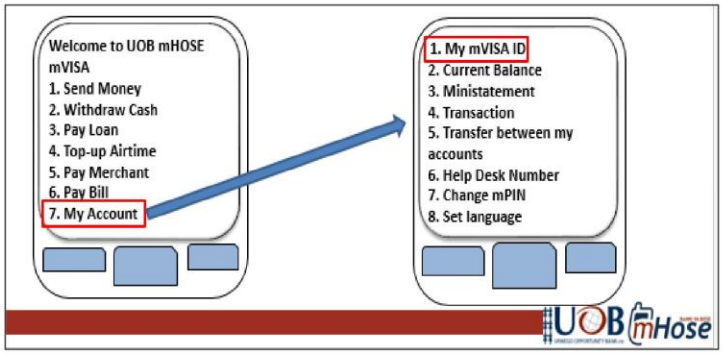
B. Administrative costs. At UOB, m-banking has automated the process of uploading and reconciling the repayment data. Traditionally, loan officers used to collect transaction information from clients mostly in paper form, reporting this to branch offices. Then, branch offices summarised the transaction information collected from all loan officers and sent it to the head office, either directly or via a regional office. The information flow from the branch office to the head office used to be done manually on a weekly or monthly basis.

The head office accumulates all information from all branch offices and stores it in an electronic database, a paper register, or both. Head offices manage their full operations on the basis of information exchange and face challenges when they lack updated information about work performed at branch offices or loan officers.

Furthermore, such a long data reporting process usually resulted in many errors. Thus, the adoption of m-Hose has enhanced the information flow.

> *Information is no longer needed to be collected in paper form or be transmitted via e-mail. Our staff can now be able to focus their efforts on their core strengths, which are to provide financial services to the poor.* (UOB, service delivery management, 2018)

Figure 1. M-banking services at UOB



Source: Printed UOB's report (2018)

UOB further adjusted their transaction expenses through the m-Hose system by reducing the number of field staff employed to reach the customers. Further, UOB loan officers are not all required to carry cash and therefore do not all need vehicles to make loan payments.

> *Loan officers regularly travelled to villages with large amounts of cash. A private vehicle was typically needed since taking the public bus was not secure. Therefore, m-banking saves UOB a great deal of money – we sold the cars and terminated driver contracts.* (UOB, IT Manager, 2018)

C. Monitoring costs. M-banking increases the amount of information available to UOB offices and their field staff. Data on loan disbursements can be tracked and monitored electronically. Thus, management at UOB has significantly strengthened its supervisory capabilities, thanks to the new technology.

Customer Perspectives

A. Weekly pre-loan trainings: UOB uses a group-lending model whose basic philosophy lies in the fact that shortcomings and weaknesses at the individual level are overcome by sharing loan repayment responsibilities collectively. Prior to the approval or disbursement of any credit, group beneficiaries attend pre-credit training facilitated by the loan officer. The period of training depends on the group, length of sessions, and type of credit facility requested. Most of the time, however, the training took between 4 and 6 weeks. In this period, m-Hose is not for establishing savings. Customers' weekly transportation expenses have to be paid for in order to attend trainings and entering to a lender group.

UOB also holds weekly 'post-loan' meetings in order to maintain group cohesion. Post-loan meetings mean that clients incur travel expenses on a weekly basis. In pre-loan training, customers appreciate the time and cost incurred but are concerned about the frequency of weekly meetings after the loan is delivered, which increases their costs. Hence, customers do not see the value in

using m-banking for loan repayment as long as UOB continues to hold weekly post-loans meetings.

> *We met frequently during the first loan cycle, which improved our interaction and risk pooling capabilities. However, the weekly transportation on a post-loan basis rendered payments difficult.* (Customer, Branch " C", 2018)

> *I know that if I miss one of the sessions, I will not get my loan, every week I make sure that I have money for transport. Every week, transport fees for post-loan meetings, This is too much for such a small amount*. (Customer, Branch "B", 2018)

B. Loan repayment: Before m-Hose was used, UOB customers had to endure a lengthy repayment process. In some cases, UOB branches are not accessible nearby. In such circumstances, a customer would carry his or her cash to the group gathering location which is usually located next to the UOB's branches. Meetings used to be quite long as each customer's cash had to be counted and recorded by the loan officer individually. Afterwards, a loan officer would have to take all the group's cash to the bank, wait for her or his turn there, and finally deposit the money. In such circumstances, a customer would spend a significant amount of time waiting for a loan officer to come back from the bank to continue their meeting. Customer costs used to be substantial in this process. The time borrowers have to spend away from their businesses could dent business profits and growth. If a firm does not grow, it would need further micro-credit with high-interest charges that could bring a risk of loan defaults. Through this process, customers also incurred substantial security risks walking and taking public transport with large amounts of loan-cash for repayment. With m-Hose, however, the process is simple and safer. At any time during the repayment period, customers pay their loans through agents before the meetings. The loan officer confirms at the meetings that the loan payments have been received. Meetings with the loan officer now involve a quick verification of the payment proof which allows the customers to return to his/her business faster. The time saved can be effectively and efficiently utilised for business development. The risks of theft and fraud are also minimised while a customer pays through m-Hose. They no longer need to carry cash in hand for loan repayment.

> *It is easier actually. I no longer have to get into long queues at the branch office. I tried to save by cutting down my transport expenses for depositing small amounts.* (Customer, Branch "C", 2018)

> *Without this system (m-banking), I would spend a significant amount of time away from my business in every time I get a small amount to reimburse my loan. In addition, I should incur substantial security risk walking and taking the bus with amounts of cash… it is really helpful on that point.* (Customer, Branch "D", 2018)

4.3. Value of m-Hose on Loan Defaults

In UOB, group meetings used to be dominated by cash collection. With m-Hose however, there is no need for extensive time to be spent collecting money, addressing missed payments, and reconciling bank slips. This time could instead be spent going through training on discussing business problems and financial education. After this, it is possible to encourage customers to make loan repayments. UOB would be subject to a lower risk of default when borrowers understand the implications of non-payment.

> *In training, we learned that the secret of preparing for the next loan is to repay the current loan. So, when we took a loan for growing our businesses, we make sure that these businesses generate profits to enable us to repay the loan, to expand our business, and to allow us to achieve our vision that in future…* (Customer, Branch "A", 2018)

Further, m-Hose offers UOB a means to monitor loan payments by providing a transaction history that is automatically linked to a database without the need for manual entry as in traditional loan disbursements and payments. Loan officers use the platform to track the loan repayment progress of their clients, particularly for checking reports prior to their weekly meetings to find out who has or has not paid. Group clients are required to remit payment via m-Hose one day before their weekly meetings. Another benefit of UOB is that it allows existing customers to query the system directly for their loan balances and records of their most recent statements rather than relying on information from their loan officers. For this to be attained, loan defaults have to be minimized.

4.4. Additional Factors Generated During Interviews Process

In the face-to-face interview, the participants were asked open-ended questions regarding m-banking adoption in Rwanda's microfinance sector. In the discussion, clients reported several problems with the m-Hose service that need to be addressed to build a scalable m-banking service in Rwandan microfinance. Some of these problems are not intrinsic to m-Hose technology. Rather, they were rooted in how it had been implemented. These problems were:

- *Poor agent network/connection*: The poor network connection was cited as a significant limitation for UOB customers using m-banking. Occasionally, customers lose connection in the middle of a transaction and are left wondering where their money has gone, since it may have been transferred from their UOB bank account but not yet reached the intended recipient. In addition, loan officers and agents who are situated near UOB branches may be inconveniently far from potential customers, creating communication difficulties.
- *Inefficient call centre*: In order to introduce users and agents to m-Hose, UOB set up a call centre to provide support. However, customers stressed that the call centre was difficult to reach because

the lines were always occupied and that the call centre did not provide sufficient answers to their questions.

- *M-banking transaction fees*: The fee structure is not well understood by users. For example, a customer in the "Gisozi Branch" reported being charged 300 Rwf (0.3 $) for their loan, whereas a customer in the "Kicukiro Branch" said they were not charged for their loan reimbursement. This creates the impression that some of the participants did not understand the cost structure of the m-banking service provided by the UOB. This may be a disincentive against using the services.

5. Discussion

The findings of this case study point to the fact that m-banking plays an important role in lessening transaction costs and high loan defaults in the microfinance industry. From the customer's perspective, the study demonstrated that m-banking saves time and reduces theft and fraud issues. However, given the benefits of m-banking, especially for customers who love the flexibility of paying at any time of day, they feel that it makes no sense for them to meet for post-loan on a weekly basis, pay related travel expenses, and sometimes pay penalties for arriving late at meetings when they have reimbursed their loans through m-Hose system. In line with the literature on emerging markets, UOB could maintain the social benefits of customer collectivism while strategically reducing group meetings (Shankar, 2007). UOB may want to consider monthly instead of weekly meetings (De Quidt et al., 2016; Dodson, 2014). The analysis further confirms that customers want a visible network of loan officers and agents working for the MFI located close to where they are located (Abbink et al., 2006). Most m-Hose agents are located closest to the UOB branches. This could add costs to the customers who travel several kilometres to reach UOB agents. Although there is no single recipe for building a viable network of branchless banking agents (Carpenter and Demiralp, 2012; Guo and Bouwman, 2016) UOB may want to consider changing their network reach in ways that make their product work (Donner and Tellez, 2008; Potnis, 2015). Supporting agents to spread transactions over the day and providing them more options to manage liquidity will result in better services and could increase usage of m-Hose services (Maurer et al., 2013).

From the institutional perspective, the UOB case confirms that m-banking and microfinance simplify administrative processes. This lowers transaction costs and achieves lower overall loan defaults (Ammar and Ahmed, 2016; Bjoerkegren and Grissen, 2018). Specifically, m-Hose offers UOB a means to monitor loan payments by providing a transaction history that is automatically linked to a database without the need for manual entry required in traditional loan disbursements and payments (Haile, 2015). Loan officers use the platform to track loan repayment progress of their clients, particularly checking reports prior to their weekly meetings to find out who has or

has not paid as group clients are required to remit payment via m-Hose one day before their weekly meetings. Digitising customers' loan data could deliver valuable information that would support more effective management decisions. Automation could be used to significantly reduce portfolio risks (Kweyu and Ngare, 2014). In line with the literature, simple and cost-effective technology such as UOB's m-Hose holds great potential by allowing the exchange of digitized data and information across a network with mobile devices (Martha and Neha, 2013; Prahalad, 2012). Further, the study analysis highlights how poor network connectivity is limiting UOB customers' usage of m-banking services (Ammar and Ahmed, 2016; Asongu, 2018; Hinson, 2011). Lack of knowledge regarding m-banking costs may also hinder widespread adoption. If customers do not have enough knowledge about the fees for services, they may lose confidence in using them (Baptista and Oliveira, 2015).

6. Implications and Future Research

The findings of this study are vital to the management of microfinance since they shed light on the effects of m-banking adoption on microfinance performance. Further, the study might be of significance to individuals responsible in formulating government policies. Knowing the impact of m-banking on microfinance performance would aid decision-makers in constructing policies that assist microfinance institutions in adopting m-banking (Hadi and Kamaluddin, 2015).

The study also provides scholars a framework for future research by improving understandings of what makes microfinance organisations accept m-banking technologies.

Due to the fact that m-banking is a new phenomenon in the microfinance sector, there is huge scope for further study. For instance, future research on the impact of m-banking on MFI performance may use a multiple case study to investigate how various banking channels are implemented by different financial institutions in Rwanda and other developing countries. Further, large-scale studies are needed to assess the impact of m-banking on the reach of microfinance institutions.

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4 Mobile Banking Impacting the Performance of Microfinance Institutions: A Case Study from Rwanda

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Mobile Banking Impacting the Performance of Microfinance Institutions: A Case Study from Rwanda

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Globally, high costs and loan defaults are the biggest threats to microfinance profitability and sustainability. This explorative study investigates how and to what extent mobile banking can foster the performance of microfinance institutions (MFIs). It expands the traditional dimensions of Transaction Cost Economics (TCE) by adding a loan default aspect. The study offers an explorative case study on "Urwego Opportunity Bank" (UOB) — Rwanda's first commercial mobile service. Based on qualitative data collected through semi-structured interviews from the bank's staff and its customers, the case shows how mobile banking allows for reducing transaction costs and loan defaults and thereby increases efficiency of MFIs. Further, it identifies high agent visibility, and sufficient savings to drive the usage of mobile banking — which, in turn, promotes the deployment of financial services to still unbanked parts of the population in emerging economies.

Keywords: Microfinance; mobile banking; IT for development; transaction costs; loan defaults.

1. Introduction

Microfinance refers to the provisioning of financial services to poor or low-income clients, including both private people and entrepreneurs who otherwise have no access to traditional financial institutions [Agnihotri (2013)]. In Rwanda, the government acknowledges the installing of Microfinance Institutions (MFIs) as an important means to tackle poverty. It puts MFIs at the core of the nation's economic growth and employment strategies [National Bank of Rwanda (2018a)].

In Rwanda, the microfinance sector currently comprises more than 470 licensed institutions; in total, their assets account for 6.6% of the country's overall financial assets [National Bank of Rwanda (2018b)]. Six MFIs offer their own m-banking and

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internet banking services [National Bank of Rwanda (2018b)]; the others depend on third-party service providers [Tumwine *et al.* (2015)].

However, MFIs in Rwanda face challenges like their counterparts in other African countries [Harelimana (2017)]. They barely reach out to all poor people; main reasons are high operational costs [Tumwine *et al.* (2015)] and a high loan default rate in the MFI sector of 8% [National Bank of Rwanda (2018b)], which — according to the Consultative Group to Assist the Poor [2015] — exceeds the maximum default rate for a financially sustainable microfinance business by 40%.

In Rwanda, less than 70% of the adult population have access to a bank [Agarwal *et al.* (2018)]. In their efforts to not only reach those, but also the other 30% of the population, MFIs need to come up with new solutions [Harelimana (2017); Isaboke and Ukwimanishaka (2017)].

Next to Internet banking (using a computer on a fixed network), mobile banking, or m-banking (using a wireless device) promises to provide financial services also to the previously underserved population [Afshan and Sharif (2016); Anderson (2010); Scornavacca and Hoehle (2007)]. Via m-banking, MFIs can more efficiently provide loans and better monitor customer compliance than previously using traditional, cash-based systems [Wamai and Kandiri (2015)]. They enhance customers' trust by sending short messages (SMS) to customers/borrowers after repayment or disbursement of a loan [Hossain and Sarker (2015)].

Adoption of mobile communication is high in Rwanda, where m-banking was the first commercial mobile service [National Bank of Rwanda (2018b)]. However, the acceptance of m-banking is still low [Harelimana (2018)], so that most MFIs in Rwanda maintain their traditional channels complementary to offering new m-banking opportunities. Due to the partially redundant efforts, they suffer from high operating costs [Harelimana (2018); Parikh (2005)].

Little is known about the "journey" of owning and discarding m-banking services in the microfinance sector of Rwanda [Harelimana (2018)]. Here, this research makes a contribution: it investigates the deployment of m-banking services to enhance the performance of MFIs in Rwanda. It investigates the case of the "Urwego Opportunity Bank" (UOB) representing a small MFI in a developing country. To this end, this work aims at answering two main questions:

(1) How can m-banking contribute to reducing transaction costs for MFIs in Rwanda?
(2) How can m-banking contribute to reducing MFIs' loan defaults in Rwanda?

The remainder of the paper is organized as follows. Section 2 establishes the research background focusing on transaction costs and loan defaults in microfinance. Section 3 outlines conducting an explorative case study as research methodology. Section 4 provides the case study of UOB, before Sec. 5 offers the main case findings and derives four company specific recommendations. Section 6 discusses the findings as well as suggests contributions to theory and practice derived from the case study. Finally, Sec. 7 concludes with summarizing our contribution and suggesting some directions for future research.

2. Transaction Costs and Loan Defaults Impacting MFIs

2.1. *Transaction Costs*

Transaction Costs Economics (TCE) explain costs associated with market exchange, typically assuming bounded rationality and opportunistic behavior [e.g. Coase (1937); Madhok (2002); Schermann *et al.* (2016); Williamson (1993)]. They group transaction costs into search, information, bargaining, decision-making, policing, and enforcement costs.

Recently, TCE have gained attention in studying the IT impact on banking [Chedrawi and Osta (2018)], m-banking [Micheni *et al.* (2013)], and microfinance [Armendariz and Morduch (2010)]. In the context of microfinance, we distinguish three types of transaction costs for MFIs: (1) costs related to group's formation and training [Sudhir *et al.* (2017)], (2) administrative costs for appraisal, documentation, disbursement [Dehem and Hudon (2013)], and (3) monitoring costs for checking loan utilizations and collecting installments [Bazinzi *et al.* (2013)].

2.2. *Loan defaults*

Korankye [2014] defines a loan as default when a customer misses at least three instalments within 24 months even without entirely stopping to repay the loan, which — in turn — would result in legal consequences for the customer [Haile (2015)] and a write-off for the MFI. Similarly, we follow the Consultative Group to Assist the Poor [2010], as we consider a loan as default when a customer does not pay back the loan and the MFI does no longer expect it to be repaid.

Loan default rates are a major performance indicator of MFIs [Angelucci *et al.* (2015); Donner and Tellez (2008); Welderufael *et al.* (2015)]. High loan repayment rates reduce MFIs' dependencies on outside financial support, which — in return — improves their institutional sustainability [Boateng and Oduro (2018); Bourles and Cozarenco (2014)]. Low repayment rates negatively affect MFIs and their customers [Ashta *et al.* (2014)]. Extreme cases of loan defaults [Bloem and Gorter (2001)] would exclude customers from the next loan and thereby reduce the MFI's customer base [Baland *et al.* (2013)].

Typically, MFIs distinguish three types of loan defaults in microfinance [Czura (2015)]:

- Customers who are willing, but unable to repay the loan because their business performs too poorly.
- Customers who decide to default although their business yields enough profit; and
- Customers who could pay back, but are unwilling to do so.

The distinction helps MFIs to actively manage loan recovery and reduce portfolio risks [Kim (2014); Oduro-Ofori *et al.* (2014)].

3. Explorative Case Study as Research Approach

To undertake this exploratory study, we opt for a qualitative approach, which allows us to gain evidence from an interpretive perspective [Merriam and Tisdell (2015)].

We use a single exploratory case study design [Creswell (2017)] as the research question requires more profound insights rather than just a high-level view [De Massis and Kotlar (2014)]. We investigate the UOB, which provides microfinance services and was the first accredited MFI in Rwanda with m-banking.

Our interpretive mode of inquiry rests upon the philosophical ideas of hermeneutics and phenomenology [Walsham (2006)]. Explorative interpretive research does not initially fix dependent and independent variables, but acknowledges the complexity of human sense making as a situation emerges [Kaplan and Maxwell (2005)]. It attempts to understand phenomena through the meanings that people assign to them [Orlikowski and Barrett (2014)].

We collected our data in Kigali, the capital of Rwanda, where UOB initiated its m-banking and still maintains its m-banking headquarter. We use both primary and secondary data.

For the secondary data, we relied on the academic literature and other documents to determine m-banking adoption issues and gain insights on the scope of m-banking. We took advantage of different UOB reports (e.g. annual reports, weekly, and monthly loan monitoring reports, financial reports, and training reports) available from its head office. To better understand and delimit the research context, we further built on documents and websites from additional stakeholders such as Rwanda's Ministry of Finance, the National Bank of Rwanda, mVisa Rwanda, telecom provider MTN Rwanda [Boote and Beile (2005)].

To collect primary data on cost issues in microfinance and on various aspects of loan defaults, we conducted 52 in-depth interviews (see Table 1). We applied purposeful sampling for selecting 10 key interviewees from UOB's management including top managers at the UOB head office, branch managers, and loan officers. Further, we chose convenience sampling for determining 42 customers. All interviewees were familiar with UOB's m-banking system and volunteered to participate in the study [Krippendorff (2013); Patton (2002)]. We guaranteed interviewees' anonymity at all stages of collecting and analyzing the data as well as the right to withdraw from the interview at any time.

The interviews took place between June and August 2018. Each interview lasted between 30 and 75 min. During and immediately after each interview, we took

Table 1. Study interviewees ($n = 52$).

Position	N	Location	Duration (in min)
IT management	1	UOB head office	30
Service delivery management	1	UOB head office	40
Branch manager	1	Gisozi Branch	60
Branch manager	1	Kimironko Branch	45
Branch manager	1	Kicukiro Branch	60
Loan officer	2	Gisozi Branch	30
Loan officer	2	Kimironko Branch	45
Loan officer	1	Kicukiro Branch	50
Customers	14	Gisozi Branch	75
Customers	15	Kimironko Branch	75
Customers	13	Kicukiro Branch	45

extensive field notes allowing us to later highlight important and valuable information and extract the relevant statements.

We used open-ended questions and encouraged respondents to express their point of view at any time. The first set of questions gave participants the opportunity to describe current practices, operations, services, and products associated with m-banking. The second, more detailed set of questions addressed the possible impact of m-banking on reducing transaction costs and enhancing loan repayment. Finally, interviewees could state suggestions for improving the deployment of m-banking in Rwanda. Instead of asking the questions in the same sequence throughout all interviews, we structured the conversation in a way that accounted for the participants' responses.

To generate case data [Saunders *et al.* (2016)], we conducted a content analysis focusing on the role of m-banking. We particularly paid attention to avoid any researcher bias, as one researcher had been involved in the technology adoption processes in Rwanda. We read the interview transcripts multiple times to identify recurrent categories which emerged from different interviews. We developed codes and grouped them into categories that originated from similar interviewee views related to the same question. We then grouped the categories into themes and subthemes. When extracting relevant quotations, we attributed alphabet codes (A, B, and C) to the UOB branches to provide for a respondent's anonymity.

4. The Case of UOB — Rwanda's First MFI with Mobile Operations

4.1. *Case overview*

In 2007, the Urwego Community Bank merged with Opportunity International Bank to become UOB. Urwego means "ladder" and hints to the bank's commitment to pull Rwandans out of poverty.

World Relief (worldrelief.org) founded the bank in 1997 as Urwego Community Bank. In 2005, World Relief joined forces with the HOPE International, a network of Christian micro-enterprise development programs in 16 countries to better serve clients. In 2017, World Relief and its affiliates in Canada and Germany sold their 50% share to HOPE International (www.hopeinternational.org). As of 2019, HOPE International held 99% of UOB shares while World Relief owned 1%.

UOB has 18 fully operational microfinance branch offices located in 11 districts across Rwanda [UOB (2018)]. Loan lending and recovering make up 90% of UOB's activities. UOB mainly grants group loans, where the group represents the customer [Kodongo and Kendi (2013)]. It also offers some individual loans to selected customers, who are not with any loan group, but have maintained a long-standing relationship with UOB.

In November 2011, Rwanda's largest telecom provider, MTN Rwanda, approached UOB to jointly offer m-banking services, but could not close the deal. In early 2012, Visa approached UOB to explore collaboration. Visa aimed at rolling out its new mobile commerce platform "mVISA" in Rwanda as one of the first countries

worldwide in order to meet the basic banking needs of Rwanda's unbanked population. Following a pilot with 157 customers in 2012, Visa closed the deal. Based on its initial experiences with "mVisa," UOB decided to expand the project and roll out m-banking on a larger scale. It introduced the new system as "m-Hose," where the "M" stands for "mobile" and "Hose" means "everywhere" in local language. m-Hose was again realized in cooperation with Visa. The system offers customers access to a full range of m-banking services via a cell phone (see Fig. 1).

After a planning stage, UOB launched its m-Hose operations in 2013. In 2018, the continually growing number of customers reached almost 70 000, with 60% of them actively using m-Hose [UOB (2018)]. To further promote its m-banking business, UOB has increased the number of active agents by about 40% from 250 agents in 2016 to almost 350 active agents in 2018 [UOB (2018)].

4.2. *M-banking impacting UOB's transaction costs*

4.2.1. *Group formation and training costs*

M-banking increases UOB loan officers' productivity in the field while it reduces the overall costs to reach customers. They can meet more groups and be more productive during the individual meetings.

> *Other MFIs in Rwanda without m-banking visit only two loan groups a day. Thanks to m-Hose, we meet up to eight groups a day.* [Branch B, Loan Officer (2018)]
>
> *Electronically making and tracking payments increases staff efficiency. Loan officers become more productive. Instead of having to focus on cash collection; they now discuss loan defaults. They spend time on informing customers about our new products and help with any questions that may have come up since the last meeting.* [Branch B, Manager (2018)]

Furthermore, at UOB, loan officers receive a fixed monthly salary and make additional money from activities such as group formation and trainings. M-banking

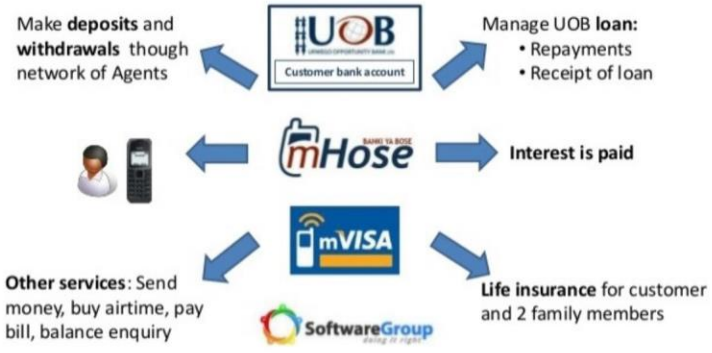

Fig. 1. M-banking services at "UOB."

frees officers up from collecting cash and thus allows them to spend more time generating extra income, which in turn increases customer satisfaction and UOB's revenue.

4.2.2. *Administrative costs*

M-banking helps field workers to handle more customers in a short period of time and thereby lowers the cost per customer for UOB. Furthermore, it reduces corruption as loan officers no longer manually maintain records.

> *Before m-banking, some late loan repayments or loan defaults were caught only days or weeks later; it was really very complicated.* [Branch C, Manager (2018)]

Thanks to m-banking, not all UOB loan officers need to carry cash and hence not all of them need a vehicle to make loan payments — another cost-saving benefit.

> *Regularly, loan officers travelled to villages with large amounts of cash. They typically needed a private vehicle because riding the public bus was not safe with the cash. So, m-banking saves UOB a lot of money – we sold the field cars and terminated the driver contracts.* [UOB, IT Manager (2018)]

The information flow from the branch office to the head office — basis for the head office's entire operation — happened manually on a weekly or monthly basis. With the launch of m-banking, UOB eliminated paperwork for daily reports. M-banking facilitates automated uploading and reconciling of repayment data. Direct entry of loan data into the system allows saving resources for salaries and computers.

> *With m-banking, each head office, regional office, branch office, and loan officer can connect to the central platform, access an individual account, and conduct daily operations. We do not have to collect information on paper or transmit it via e-mail any longer; this is a huge gain.* [UOB, Service Delivery Manager (2018)]

4.2.3. *Monitoring costs*

M-banking enriches the information available to UOB's officers and agents. Better information technology (IT) tools support monitoring and allow following up on loan disbursement data. Thereby, it improves the supervision capabilities for UOB's management.

> *Through the m-banking system, we send customers an SMS to remind them about upcoming loan payments. This saves us money as our loan officers neither have to call customers nor travel for such reminders. Deploying the m-Hose system has proven really effective for reducing late payments.* [UOB, IT Manager (2018)]

Overall, m-banking contributes to reducing transaction costs for Rwandan MFIs in several ways. Process automation allows UOB to save three percent

administration costs [UOB, IT Manager (2018)]. Due to better customer training, UOB needs fewer resources for travel. Hence it can invest in more and easier reachable access points the basis for additional m-banking business and revenue.

4.3. *M-banking impacting UOB's loan defaults*

Traditionally, UOB spent most time in group meetings on collecting cash — addressing missed payments and reconciling bank slips. With m-banking, group meetings spend their time on trainings and on discussing business problems, which may even successfully encourage customers to repay loans. Customers better understand the implications of not paying in time, and UOB experiences less defaults.

> *During a training session, we learn that the secret of preparing for the next loan is to repay the current one. So, when we take a loan for growing our business, we make sure that the business generates enough profits to enable us repaying the loan. . .–. . .to ask for the next loan, expand our business, and ultimately allow us supporting our families.* [Branch B, Customer (2018)]

The m-Hose system provides a transaction history for every customer. Having digitized a customer's loan data provides improves the decision of UOB's management in the context of granting or not grating future loans. Thus, it reduces risky loans.

> *M-Hose allows us much better monitoring and managing of loan portfolios. We require group clients to remit payment via m-Hose one day before their weekly meeting. With m-Hose, our loan officers track their customer' loan repayments prior to the weekly meeting. So, they know in advance who has not yet paid. Customers also can track their loan balance before the meeting.* [UOB, Service Delivery Manager (2018)]

Overall, m-banking seems to positively contribute to reducing MFIs' loan defaults in Rwanda, even if exact calculations are not possible as we cannot control for all drivers of loan defaults.

> *Over time, the UOB's net benefits from m-banking are still small, as we invested a lot of time and efforts. But recently, we generated positive results in loan recovering from deploying m-Hose (m-banking).* [UOB, Service Delivery Manager (2018)]

4.4. *Customer perspective on UOB's m-banking offerings and processes*

UOB pursues a group lending model assuming that collective responsibility can mediate individual issues. Prior to the approval or disbursement of any credit, the group beneficiaries must participate in weekly "*pre-loan*" trainings facilitated by a

loan officer. Further, UOB holds weekly "*post-loan*" meetings to maintain group cohesion.

> *Yes, frequent meetings during the first loan cycle improved our interaction within the group and helped our risk-pooling attitude. But the post-loan weekly transport makes it difficult to meet the payment obligations. Not only is transportation expensive, we also need the time for doing our business – to earn a profit.* [Branch D, Customer (2018)]

Attendance at weekly group meetings is compulsory causing weekly travel costs. Failure to comply incurs a fine which varies per group. While customers value the travel time and costs related to *pre-loan* trainings, they are concerned that frequent *post-loan* meetings increase their costs due to fees associated with weekly travelling.

> *With m-banking, I no longer have to get into long queues at the loan officer's site. I can deposit even small amounts without leaving my business and paying for the transport.* [Branch C, Customer (2018)]

M-banking makes the repayment process simpler and safer. Customers can pay their loan through agents any time before the meetings. During the meeting, loan officers only verify the payment proof and confirm having received the loan payments. This allows customers to spend the gained time on developing their business.

> *Every week, I make sure that I have 900 Rwandan's francs (£1) to pay a motorcycle for attending the post-loan meetings. If I get a loan of RWF 50,000 (£55) and pay £1 per week – what kind of business is that?* [Branch A, Customer (2018)]

Overall, m-banking allows for disentangling post-loan meetings and loan repayment, which is now possible via local agents. It benefits customers as they no longer have to carry cash over long distances, but can easily repay parts of their loans through local agents at any time. Hence, m-banking contributes to safety and ease of loan repayment from a customer perspective.

5. Case Insights and Resulting Recommendations

In our work, we find evidence that m-banking increases UOB's performance by reducing transaction costs and loan defaults. Overall, it allows UOB to centralize information regarding clients and loan portfolios and to simplify administrative processes such as daily tracking transactions and monitoring which loans are in default. In more detail, we derive four main findings and each leading to a recommendation for UOB:

First, we find that m-banking contributes to enhancing the efficiency of UOB. Thanks to cashless processes, UOB loan officers do not need to handle substantial amounts of cash. Customers appreciate improved security as they no longer need to carry large sums of money while traveling to group meetings or to the bank branch

for loan repayment. These findings confirm that earlier findings that cashless processes increase efficiency and make m-banking an important innovation for developing countries [e.g. [Belayeth (2017); Donner and Tellez (2008); Rahayu and Rahadian (2016)] Hence, we recommend:

> *Recommendation* 1: UOB may want to further strengthen its m-banking efforts.

Second, we find that UOB's weekly required "pre-loan" and "post-loan" meetings and trainings are the most important obstacle to further m-banking success — for UOB, its customers, and the Rwandan society as a whole. Customers do not want to pay the travel costs for weekly returns — even less so when they manage loans via the mobile phone [Boateng (2015)]. Hence, we recommend:

> *Recommendation* 2: UOB may want to significantly reduce the number of required on-site meetings, especially the post-loan ones.

Third, we support the importance of a visible network of loan officers and agents working for UOB, who administer cash deposits and withdrawals into the m-Hose system — even in the era of m-banking [Potnis (2015)]. Loan officers and agents located close to UOB branches, but far away from potential customers make it expensive for customers to reach them. To make officers and agents more easily accessible, UOB could partner with small shops [Maurer*et al.* (2013)] and bill payment counters [Kim *et al.* (2018a)]. Hence, we recommend:

> *Recommendation* 3: UOB ought to enlarge its network of loan officers and agents and "place" them closer to actual and potential customers.

Finally, many actual and potential customers do not feel well informed about UOB's offerings. They would appreciate informative tariff information for specific transactions displayed at as many places as possible. According to our study, strengthening the awareness of UOB's m-banking services and providing relevant information independent of meeting an officer or agent, could help gaining customers, thereby increase UOB's earnings from m-banking and enhance its overall success in the microfinance sector [Wright *et al.* (2015)]. Hence, we recommend:

> *Recommendation* 4: UOB should increase the visibility of its m-banking services via digital and analog means by placing service and tariff information at as many contact points as possible.

6. Discussion

While this work relies on a single case study, the scope and depth of UOB's microfinance operations are comprehensive with regard to the geography, time, and particularly the interweaving with customers' daily life. We regard the UOB case as representative for the impact of mobile banking on the performance of MFIs. Hence, rather than just having collected "spot evidence," we consider our data sufficiently

robust and reliable to allow for a qualitative in-depth discussion of our case findings and necessary generalizations.

Below, we discuss our case findings before we offer some managerial implications of our work and outline our theoretical contribution.

6.1. *Case findings*

From our explorative case study, we have gained helpful insights into Rwanda's first mobile microfinance service provided by UOB. Our research finds that overall m-banking allows for increasing the efficiency and performance of MFIs. The UOB case confirms that m-banking and microfinance first-of-all simplify administrative processes and thereby lower transaction costs [Uwamariya and Loebbecke (2019)] and help to achieve lower overall loan defaults [Ammar and Ahmed (2016); Bjoerkegren and Grissen (2018); Karlan *et al.* (2016); Kweyu and Ngare (2014)].

Especially automating formerly manual processes contributes to reducing transaction costs. In the case of UOB, humans formerly had to execute processes like filling out paperwork and crossing large distances for daily banking operations. In line with the literature, simple and cost-effective technology such as UOB's m-Hose — available to the "Bottom of Pyramid" in emerging markets — can lever great potential around the exchange of digitized data and information across a network with mobile devices [Martha and Neha (2013); Prahalad (2012)].

However, the positive effect of m-banking on transaction costs partially diminishes in the case of UOB due to the salient gap between efficient financial transactions and mandatory frequent personal group meetings, which cause high transportation costs for customers and seem to be a major obstacle to successful microfinance dissemination. In line with the literature on microfinance opportunities in emerging markets, UOB may want to consider monthly instead of weekly meetings [De Quidt *et al.* (2016); Dodson (2014); Shankar (2007)].

Our analysis confirms customers wishing a visible network of loan officers and agents working for the MFI located close to potential customers [Abbink *et al.* (2006)]. However, increasing the network of humans on UOB's payroll certainly raises the human resources costs, while it would only eventually reduce the transaction costs. UOB counts on enlarging the number of its officers and agents from 250 to 350 between 2016 and 2018. This should lead to overall higher m-banking revenues outweighing the additional costs. In addition, UOB may want establish a sophisticated online presence for its loan officers and agents with chats or voice over IP calls for communication, which would replace human processes and thereby reduce transaction costs. Successfully building upon the use of information and communication technology (ICT) obviously requires sufficient ICT literacy among market actors [Snyder (2002)]. UOB may want to suggest that governmental or non-governmental entities seeking to benefit from m-banking or related constraint-based innovations ensure cost-efficient awareness and education programs [Agarwal *et al.* (2017)].

6.2. *Managerial implications*

Our case evidence leads to actionable knowledge on which MFIs and politicians can base their macro- and micro-level strategy of m-banking implementation. Generalizing from the UOB case, our study offers five managerial implications:

- *Taking a TCE perspective* helps microfinance decision makers to plan efficiency gains more systematically. The TCE perspective spans all areas of innovation [Baland *et al.* (2013); Belayeth (2017); Kim (2014)] and reaches beyond the individual perspectives of a loan officer, an internal IT manager, or a loan clerk.
- MFIs in emerging markets cannot count on technological solutions that require heavy upfront investments for software development and infrastructure [Prahalad (2012); Uwamariya and Loebbecke (2019)]. Instead, they may *take advantage of* systems that get developed in wealthier markets or by large open source communities and are available *as "Infrastructure as a Service (IaaS)"* or "*Software as a Service (SaaS)" arrangements*, based on *co-ownership*, or *provided by some non-governmental organization (NGO).*
- Sizeable savings portfolios are crucial for reducing transaction costs (less transactions for higher volume) and thus for increasing m-banking efficiency for MFIs Ky *et al.* [2018]. UOB's comparably small savings portfolios hinder efficiency gains from m-banking. They partially result from its unique joint liability principle. To enhance UOB's security in case of loan defaults [Hadi and Kamaluddin (2015)], UOB requires customers to deposit a fixed amount into a saving account without any interest. If one member fails to repay a loan, UOB extracts other members' saving funds to cover the outstanding loan balance or even loan defaults. Making all group members suffer as they can no longer access additional loans limits their ability to ask for larger loans [Bond and Rai (2009); Mookherjee and Motta (2016)]. UOB may want to reconsider the trade-off between its security and the typical portfolio size — and work towards *easing the joint liability principle.*
- Similar to the previous point, a "one size fits all" strategy, i.e. only offering one type of savings accounts, keeps transaction costs low. However, it also excludes the business potential of better targeting costumers' different short-term and long-term needs [Dodson (2014)]. UOB may want to *carefully re-balance cost and revenue when considering customize savings accounts — and offer at least one or two account types paying interest* [Bond and Rai (2009)].
- Finally, our research encourages a *wider dissemination of MFI services, here m-banking, in emerging countries.* Having established the infrastructure for an m-banking system, we find it comparatively easy to leverage synergies — for instance by complementing the system for loan processing and monitoring by systems that foster, manage, monitor, and incentivize bank deposits. Approaches like the one carried out by UOB are also open to alternative borrowing systems such as crowd lending — even though this would require that the capital is not only centered in banks or with a few wealthy individuals [Uwamariya and Loebbecke (2019)].

6.3. *Theoretical contribution*

From a *theoretical perspective*, we contribute to highlighting and reconfirming the importance of transaction cost efficiency for succeeding in a marketplace [e.g. Belayeth (2017); Fachini *et al.* (2008); Malone *et al.* (1987); Micheni *et al.* (2013); Picot *et al.* (2008); Schermann *et al.* (2016); Sudhir *et al.* (2017)]. We find that — in the context of technology dissemination in emerging markets — the TCE perspective resembles a resource constraint perspective for looking at "Bottom of Pyramid" marketplaces [Agarwal *et al.* (2017)].

As our results support that, in emerging markets, innovation is rather about being "resourceful" than about being "cheap" [Agarwal and Brem (2017a)], they vastly match earlier findings of frugal innovation research [Agarwal and Brem (2017b)]. Cost-effective and easy to operate solutions allow for transforming an emerging market by offering a constraint-based innovation such as lending supported by mobile technology. At the same time, non-digital solutions such as fostering loan reliability through group commitment and personal meetings provide an alternative way to tackle m-banking challenges. In the case of UOB, group liability compensates for the lack of securities in "Bottom of Pyramid" markets. The psychological principles behind the liability of a group of neighbors or acquaintances can hardly be mirrored on a technological level — introducing a friction into that kind of constraint-based innovations [Abbink *et al.* (2006); Agarwal *et al.* (2017); Sandberg and Aarikka-Stenroos (2014)]. Hence, non-digital solutions at least help bridge the time until country-wide technology adoption and according education allow for more efficient solutions.

7. Conclusion and Suggestions for Future Research

With the case study of UOB's m-banking services, we address a central topic of global development research around a series of socio-technical problems that mangers and governments are concerned about. Microfinance is an area where technology is not just a negligible add-on, but it actually provides a strong lever to lift banking back on a level where it can profoundly improve the welfare of a country.

The case UOB sheds light on how to foster m-banking and thereby connect Rwanda's still unbanked population to the country's economy. This should yield economic benefits such as new jobs and diversified economic activities throughout the country, and thereby ultimately strengthen the nation's economic and societal development and national welfare [Guo and Bouwman (2016); Kim *et al.* (2018b)].

Finally, our study can only be a start. We see the need and the opportunity to complement our study along several arrays: For instance, future research on mobile banking impacting the performance of MFIs may want to

(1) adapt a *multiple case study* to investigate the implementation of various banking channels by different financial institution in Rwanda and other developing countries;
(2) assess how the increased efficiency resulting from mobile banking translates into customers financial advantages such as reduced costs for loans;

(3) include other players' competitive reactions into its qualitative or quantitative analysis: at what point should one expect concentration effects as they are known from many other platforms offering digital services?
(4) complement our exploratory case study by explanatory research to analyze in more detail into how and why mobile banking affects the performance of MFI — taking into account reduced marginal costs and revenues in the digital world and asking who could gain rents from which market;
(5) dig deeper into *regulations and availability of financial infrastructures* as drivers or challenges for future successful commercial m-banking dissemination and adoption.

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Biography

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5 Mobile Payment Enhancing Tourism in Emerging Markets: A Qualitative Study among Small and Medium-Sized Enterprises (SMEs) in Rwanda's Tourism Sector

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Mobile Payment Enhancing Tourism in Emerging Markets: A Qualitative Study among Small and Medium-Sized Enterprises (SMEs) in Rwanda's Tourism Sector

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ABSTRACT

Technological advancement has fueled various new mobile payment (m-payment) services, which transform the payment industry and help develop established and newly created tourism businesses. However, in emerging markets, users who adopt m-payment services are rare – slowing down the tourism sector's development. In this paper, taking a multi-stakeholder theoretical perspective on technology adoption, we examine the company-, customer- and country-level drivers and consequences of adopting m-payment services among small and medium-sized enterprises (SMEs) in the Rwandan tourism sector. Our analysis leads to recommendations for m-payment services as levers of tourism sector growth and welfare in emerging countries.

KEYWORDS

Mobile payment; emerging markets; technology rollout; tourism industry; small and medium-sized enterprises (SMEs)

Introduction

Information and Communication Technology (ICT) enables people to carry out their transactions in new ways (Gofe & Tulu, 2019). Mobile services – facilitated through wireless technology and miniaturization – allow for creating value-adding platforms around m-payment services (Kumari & Khanna, 2017; Rootman & Krueger, 2020). Recently introduced m-payment services reach unbanked people and businesses in emerging economies (GSMA, 2019; Loudon, 2016). At the end of 2019, they spread 90 countries and 866 million registered accounts, and processed USD 1.3 billion per day (GSMA, 2019). Most m-payment users (45.6%) come from Sub-Saharan Africa, South Asia (33.2%), and East Asia and the Pacific region (11%; GSMA, 2019). M-payment services grow significantly (e.g., by 20% in 2017). Still, about 1.7 billion adults, mostly in emerging countries, lack access to financial services (Demirguec-Kunt, Klapper, Singer, Ansar, & Hess, 2018).

In the tourism industry, mobile services facilitate pre-booking and booking transactions (Tan, Lee, Lin, & Ooi, 2017). Travelers can use them for trip planning, price comparison, flight or hotel room booking, or on-site payments (Vallespin, Molinillo, & Ramos, 2018), enjoying payment convenience, discounts, and balance monitoring (Guo & Bouwman, 2016). Companies gain from low processing fees and more touchpoints during the 'customer journey' (World Travel and Tourism Council, 2019).

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In emerging markets, the tourism sector leverages economic growth by attracting foreign currency funds (Nandonde, 2015). 'First-world' country tourists typically carry smartphones and appreciate personalized m-payment services while being literate about privacy issues. As many of them are familiar with the technology, small and medium-sized enterprises (SMEs) in the Rwandan tourism sector (Tourism SMEs) can take advantage of high-quality user feedback (Merisalo-Rantanen, Rossi, Hallikainen, & Nurmimaeki, 2009). In parallel, m-payment services require adequate technical infrastructure and regulation to perform in the market.

In Rwanda, tourism drives growth (National Information and Communication Infrastructure Program [NICI], 2015) while dropping behind other industries regarding ICT adoption (Foster & Graham, 2014).

In the m-payment ecosystem, merchants are service providers and customers of m-payment services. While research has investigated m-payment adoption in general (Chong, 2013; Lu, 2019; Maity, 2010; Maity & Dass, 2014; Siau & Shen, 2003), researchers have rarely taken the merchant's perspective (Boateng & Afeti, 2019; Dahlberg, Guo, & Ondrus, 2015; Dennehy & Sammon, 2015).

Here, we contribute. From a multi-stakeholder perspective on technology adoption, we examine the company-, customer- and country-level drivers and consequences of m-payment services adoption from the tourism company perspective. We focus on Rwanda and its Tourism SMEs and contribute to the academic discussion on technology adoption drivers and consequences (Uwamariya & Loebbecke, 2020), particularly in the new context of m-payment services. We further contribute to the discussion on m-payment and its impact on economic and societal development (Avgerou, 2008; Heeks, Boateng, Molla, & Hinson, 2008; Walsham, 2010).

The remainder, this explorative paper is organized as follows. In section 2, we present the study context. In section 3, provide a literature brief and outline the gap. In section 4, we outline our research approach and data collection. We present drivers and consequences in section 5, discuss them in section 6, and conclude with suggestions for future research and recommendations.

Study context: ICT rollout and mobile payment in Rwanda

Rwanda ranks 110 among 140 countries concerning its technology readiness in the tourism industry (Travel and Tourism Competitiveness Index, 2019). Most (> 90%) Rwandan tourism companies are SMEs and have some online presence. Still, it is mostly the Rwandan 'Tour and Travel Association', which digitally advertises Tourism SMEs' offers via its portal and provides online booking services (Kahiga, 2016; Odunga, Manyara, & Yobesia, 2019).

As of 2019, only one-third of the Rwandan population has Internet access. Connection costs are high, even though – or because – the government has laid fiber-optic networks across the country. Travelers in Rwanda barely use ICT-enabled services (Muvunyi, 2017).

Most Rwandan m-payment services rely on the Short Message Service, not requiring smartphones. In collaboration with international 'FinTech' providers, mobile network operators offer m-payment services that allow customers to transfer money between their mobile and bank account (Mukamanzi & Ndikubwimana, 2018), and to many other

African countries (National Bank of Rwanda – NBR, 2019). Some 'Points of Sale' (POS) are also connected to m-payment services.

Together, governmental organizations, banks, and other companies of the financial sector launched m-payment services in Rwanda. MTN, the country's largest telecom provider, introduced the first service in 2010. In 2011 and 2013, Tigo cash and Airtel money followed. The National Bank of Rwanda complemented services with an integrated payment processing system, comprising automated money transfer and clearing-house channeling of high- and low-value transactions. Its securities depository transacts all securities issued in Rwanda.

However, the system barely met the financial needs of the population. Hence, banks and stores also installed more than 11,000 mobile POS devices throughout Rwanda (National Bank of Rwanda [NBR], 2019).

Two entities share the supervision of the Rwandan m-payment industry with its telecommunication and financial services: the Rwanda Utilities Regulatory Authority and the National Bank of Rwanda. To attract 'FinTech' businesses, Rwanda pursues a 'sandbox' approach to regulation, allowing for testing business ideas with limited legal liabilities under regulatory supervision (Zetzsche, Buckley, Arner, & Barberis, 2017). Thus, regulators can stay informed about industrial developments and revise regulations (Wechsler, Perlman, & Gurung, 2018).

Mobile payment adoption: a literature brief

Trial-and-error solutions and provisional pilots for market tests characterize the m-payment industry (Dahlberg et al., 2015; Dermish, Kneiding, Leishman, & Ignacio, 2012; Evans & Pirchio, 2015).

Conceptually, researchers regard m-payment as a transaction initiated by a mobile phone without using the voice function (Foster & Heeks, 2013) or as a private or commercial process with electronic mobile communication devices initiating, authorizing, and carrying financial transactions (De Luna, Liebana-Cabanillas, Sanchez-Fernandez, & Munoz-Leiva, 2019). Thus, along with the literature (Au & Kauffman, 2008; Lu, 2019; Ozcan & Santos, 2015; Sorensen, 2018), we define m-payment as any payment that uses a mobile device to initiate, authorize, or confirm an exchange of funds in return for products or services.

Multiple studies have investigated drivers and consequences of mobile service adoption and m-payment services in particular (Chandra, Srivastava, & Theng, 2010; Dahlberg et al., 2015; Gerpott & Kornmeier, 2009; Humbani & Wiese, 2018; Lu, Yang, Chau, & Cao, 2011; Slade, Dwivedi, Piercy, & Williams, 2015; Zhou, 2013). Substantially fewer works cover company- or country-level concerns (Jocevski, Arvidsson, & Ghezzi, 2020; Lu, 2019; Ozcan & Santos, 2015; Sorensen, 2018), creating a significant gap in the literature (Boateng & Afeti, 2019; Slade et al., 2015; Sorensen, 2018).

Research method and data collection

For this explorative paper, we follow a qualitative research approach (Loudon, 2016) to determine company-, customer- and country-level drivers and consequences of m-payment adoption among Rwandan Tourism SMEs. This allows us to examine patterns on the

interaction between people and phenomena in rich detail (Mazonde & Carmichael, 2020; Sutton & Zubin, 2015). To improve the validity and reliability of findings, we triangulate them via primary and secondary sources (Creswell, 2017; Yin, 2014).

We obtained our primary data from 29 interviewees, identified through purposive sampling (Ilker, Sulaiman, & Rukayya, 2016; Patton, 2002) among 103 Tourism SMEs in Rwanda. The interviewees comprise m-payment adopters and 'non-adopters'. Eleven of them work at tour operator companies, ten come from ticket vendor companies, and eight from handcraft companies. They are top-level managers and IT Officers (Table 1). The interviews lasted between 30 and 90 minutes. We conducted both open- and closed-ended questions for a compromise between comparability and comprehensiveness of answers (Rubin & Rubin, 2012; Whiting, 2008). Hence, we could cover both, known key issues and phenomena we did not anticipate (Yin, 2014). The questions addressed company-, customer- and country-level drivers and consequences of m-payment services adoption. Before the interviews, we reviewed the interview guide several times to ensure that the questions were adequate and in line with the study objectives (Whiting, 2008). During the interviews, we encouraged participants to share their thoughts on how and why they decided for or against adopting m-payment services and on what they regard as drivers and consequences of m-payment services adoption. To ensure the validity and consistency of answers, researchers double-checked the transcripts.

The interviews took place at one of the study author's offices in Kigali, Rwanda, in June 2019. We assured participants confidentiality and anonymity (Wiles, Crow, Heath, & Vikki, 2008). All interviewees indicated that they happily participated in the study

Table 1. List of interviewees.

Interviewee	Company	Mobile Payment Service Offered	Duration
General Manager	Air Ticketing A	None	60 min
Operational Manager	Air Ticketing B	None	40 min
Operational Manager	Air Ticketing C	None	30 min
Operational Manager	Air Ticketing C	M-payments at POS	40 min
Operational Manager	Air Ticketing D	M-payments at POS	30 min
Operational Manager	Air Ticketing E	None	90 min
IT Officer	Air Ticketing F	M-payments at POS	50 min
IT Officer	Air Ticketing G	In-store website m-payment	75 min
Finance Directorate	Air Ticketing H	None	35 min
Finance Directorate	Air Ticketing I	M-payments at POS	40 min
General Manager	Handcraft A	None	30 min
General Manager	Handcraft B	None	35 min
Operational Manager	Handcraft C	None	50 min
Operational Manager	Handcraft D	None	30 min
Operational Manager	Handcraft E	None	45 min
Operational Manager	Handcraft F	M-payments at POS	60 min
IT Manager	Handcraft G	In-store website m-payment	30 min
IT Officer	Handcraft H	M-payments at POS	40 min
IT Officer	Tour Operator A	SMS based m-payments	75 min
IT Officer	Tour Operator B	SMS based m-payments	30 min
IT Management	Tour Operator C	SMS based m-payments	50 min
General Manager	Tour Operator D	None	50 min
General Manager	Tour Operator E	None	45 min
General Manager	Tour Operator F	None	30 min
Operational Management	Tour Operator G	None	75 min
Operational Management	Tour Operator G	None	60 min
Operational Management	Tour Operator H	None	60 min
Operational Management	Tour Operator H	SMS based m-payments	50 min
Operational Management	Tour Operator I	None	30 min

(Krippendorff, 2013; Patton, 2002) and indicated that they could contribute to the study topic (Bongomin & Munene, 2020; Yin, 2014).

In addition to the interviews, we analyzed a broad range of documents, such as consultancy reports, official webpages, annual reports, press releases, and presentation reports of the m-payment stakeholders. This allowed us to form a richer picture of the market background and issues in m-payment services adoption (Petrova & Wang, 2013).

For our qualitative content analysis (Saunders, Lewis, & Thornhill, 2016), we initially created a hierarchy of categories and subcategories and analyzed and coded the interviews at the sentence level (Guo & Bouwman, 2016). In the interpretation phase, we connected the categories (Hsieh & Shannon, 2005; Saunders et al., 2016) and assigned them to one or several of the three driver and consequence levels (company, customer, and/or country). We repeated this process to ensure accurate and consistent coding (Smith, Flowers, & Larkin, 2009). We anonymized interviewees for publication so that they could verify their statements, but readers cannot identify interviewees (Mohajan, 2018).

Findings

This section presents the company-, customer- and country-level drivers and consequences of m-payment adoption from the perspective of the Rwandan Tourism SMEs.

Drivers of m-payment adoption

On the *company level*, interviewees highlighted the importance of knowledge and skills.

Knowledge and skills

Decision-makers' knowledge plays a key role in technology adoption. Here, interviewees point to the importance of m-payment-related knowledge and its business impact.

> Not everyone will understand how this technology works. Now, I do not quite understand how this technology works and how good it is … we need to see what exactly it does. (Operational Management, Air Ticketing C, 2019)

> Here, most customers are coming from outside of the country; most of them are tourists coming here in their way to go to the airport. So, if I make a mistake in billing …, where should I get my money? (Finance Director, Air Ticketing H, 2019)

> I am afraid to invest in m-payment platforms. We need trainings to understand how to shift from the desktop to the mobile environment. Our clients need training, too. (General Manager, Tour Operator D, 2019)

Tourism SMEs also report difficulties in finding local staff with sufficient technical skills to deal with complex, m-payment-related issues.

> I would love to deploy m-payment in our company, but I cannot find a capable IT designer who would meet my needs at a reasonable price. Consultants from Kenya cost a fortune, most of them I cannot afford. However, if I find someone at a reasonable cost, I am willing to sign a contract and get into it. (General Manager, Handcraft A, 2019)

> In Rwanda, we need IT professionals that specialize in administering and maintaining m-payment. They must follow up on all technical issues and changes and offer support to us business users. (Operational Manager, Air Ticketing C, 2019)

On the *customer level*, referring to both, merchants or tourists, interviewees stated acceptance with regard to both privacy concerns and financial constraints as drivers of m-payment services adoption.

Customer acceptance

Interviewees emphasized customer acceptance as an important driver. Respondents highlighted the importance of security and privacy protection efforts.

> Most of our big customers are international. It seems to me that foreign customers are reluctant to pay with our systems; they may consider them less secure. (Operational Manager, Air ticketing D, 2019)

> Traditional marketing campaigns are not enough to promote m-payment in Rwandan tourism; The government needs to support us. They should develop a special marketing campaign to convince tourists that our m-payment systems are secure, that they can trust them. Otherwise, the m-payment will never succeed in tourism. (IT Management, Tour Operator B, 2019)

> We invested in m-payment two years ago, and still, 80% of our clients prefer cash. (IT Management, Tour Operator C, 2019)

Furthermore, customers are bound to financial constraints.

> My problem is not money to invest, but I do not see how to recover the resources I invest. I doubt that our clients are ready to pay with phones. (General Manager, Handcraft B, 2019)

> I am convinced that m-payment will improve my business and create value for my customers. In the near future, we expect to see fifteen percent or more of our bookings and payments through the mobile system. I hope that I will not be disappointed and lose my money. (Operational Manager, Air Ticketing C, 2019)

> We don't want to end up spending money on the machine not being used actively. It really depends on the market movement. (General Manager, Handcraft B, 2019)

On the *country level*, respondents stressed viable devices, connectivity, infrastructure, and effective regulation as important drivers.

Viable devices, connectivity, and infrastructure

Concerning the technical requirements, interviewees named viable devices as an important driver.

> Some mobile devices are more capable of conducting m-payment than others. The old telephones are barely good enough. Our customers and we ourselves need smartphones; then they need an operating system and features for getting into m-payment. Only a small number of local customers own a smartphone. Nevertheless, we cannot just rely on foreign customers. (Operational Management, Tour Operator H, 2019)

They further highlighted connectivity as a technical driver. A lack of mobile network connectivity in some regions of Rwanda impedes m-payment adoption among Tourism

SMEs. Unstable Wi-Fi connections result in negative customer experiences, frustrate staff, and ultimately harm sales.

> I am mostly scared about getting disconnected or the network malfunctioning. Technical problems of this kind really handicap our system. It does not make sense to invest USD 70 per month and repeatedly experience the network problems as we do here. (IT Officer, Air Ticketing G, 2019)

> Clearly, without steady Wi-Fi connectivity, we simply cannot do our job; it is difficult. Imagine a tourist who logs into our system and cannot finish her transaction because of interrupted Internet connectivity. Do you think she will try again? No, she will not. We really need stable and secure connections at a reasonable price. (IT Manager, Handcraft G, 2019)

Besides devices and connectivity, the overall technical infrastructure is equally important. Here, respondents particularly pointed to electricity, telecommunication systems, and POS systems.

> For example, who should be responsible for setting up mobile POS machines? This is still an open issue. (General Manager, Handcraft A, 2019)

> In Rwanda, we lack readers at the mobile POS; that is why m-payment does not really fly (IT Officer, Handcraft H, 2019)

> In this place, you can even spend two hours without electricity. In such a circumstance, why should I lose my money while I will not use such a payment system? I hope our cooperative will accept to invest in a generator otherwise; I do not need any sophisticated equipment. (Operational Management, Tour Operator G, 2019)

Effective regulation

Interviewees benefit from streamlined political processes from the regulatory 'sandbox'. They appreciate smoother experimentation with new products and services and the resulting positive impact on innovation. They also highlight the importance of clear responsibility within the regulatory environment.

> Yes, the regulatory framework facilitates the innovation. It helps to reduce the overall time to market – especially by streamlining the authorization process. (Operational Management, Tour Operator H, 2019)

> I used to know some people, who abandon their product offerings early in the development process without even testing anything. I hope that the new framework changes their attitudes towards trying out some options, experimenting with what may work. I hope that this will lead to more solutions that I could use. (IT Officer, Air Ticketing F, 2019)

> The current sandbox regulation has too many fathers. Too many institutions such as the Utilities Regulatory Authority and the National Bank are involved. I am confused about the new process. Whom shall we address in case of a complaint? Who is in charge? Who can help? (Operational Manager, Handcraft C, 2019)

Effective regulation comprises cooperation among m-payment stakeholders in the regulatory environment. Interviewees complained about multiple bilateral connections and a mix of arrangements, which they experience as redundant, resulting in increased costs and failures.

> We see the bilateral negotiations between one bank and one telecom operator. However, we need banks and telecom operators to cooperate and create a single set of interoperable cross-bank and cross-telco rules. (IT Officer, Air Ticketing G, 2019)

> It is good if visa bank and telecom operators interact; it helps reducing formerly huge commissions. However, it is still complicated. The strong position of banks and credit card organizations, who rule the market, hinders the success of new market entrants. (Operational Management, Tour Operator H, 2019)

> Who is skimming the most money off the top . . . the system needs to be cost-effective for all involved - if big operators are a player, it is likely they will try to take the lion's share of the payment amount in 'commissions. (IT Officer, Air Ticketing G, 2019)

> Is there a dedicated unit within the National Bank or the Utilities Regulatory Authority that coordinates or monitors the sandbox framework? (Finance Directorate, Air Ticketing H, 2019)

> The National Bank and the Utilities Regulatory Authority should clarify the issues regarding refunds and wrong payments. I do not know what to do in case of theft, misuse, or an unauthorized use of cards by a customer. Whom should I notify? Is there an automated complaint process? We really need more guidelines on that. (Operational Manager, Air Ticketing E, 2019)

Consequences of m-payment adoption

Next to investigating m-payment adoption drivers, we focused on consequences from adoption on the company-, customer- and country-level from the interviewees' perspective.

Interviewees highlighted improved customer experience as well as convenience and time-saving as the two major consequences.

Improved customer experience

Enhanced services improve customer experiences:

> Of course, m-payment services offer our current and potential customers additional payment options. In that way, it could better tie them to us. (Operational Manager, Air Ticketing D, 2019)

> I know that with m-payment, we can offer better services to our customers; they can compare our prices and service: it also allows us to meet the changing needs of the market quickly. (Finance Directorate, Air Ticketing I, 2019)

Thereby businesses can attract new customers:

> By offering m-payment, we can enhance customer services, and we might get customers who we would not have otherwise. For example, tourists who do not have a debit card with them while traveling might use our mobile system for shopping. (IT Manager, Handcraft G, 2019)

In addition, businesses can improve customer retention:

> To continue to retain my customers and business partners, our company had to adopt this payment system especially for those of my suppliers, customers who are outside Kigali and outside the country. Now people in Kenya can send me the handcraft products that we need

> and pay them easily using MTN or M-Pesa as we have their agent here. (IT Management, Tour Operator, C, 2019)

Convenience and time-saving

Many interviewees mentioned the customer convenience of m-payment services. They also refer to time-saving, which enhances cost-effectiveness as another driver.

> In a business like this, efficiency and quality are the most important. Anything that can save a simple 35 seconds can make a big difference at the end of the day. Sometimes we just need those 35 seconds to serve a customer who is on his way to the airport. (Operational Manager, Handcraft F, 2019)

> Using m-payment services can be more convenient for our clients, and it may save time for them as well as for us. We aim to satisfy our customer's needs quickly. In this industry, faster means more revenue and more business. (Operational Management, Tour Operator H, 2019)

Discussion

Our research examined the company-, customer- and country-level drivers and consequences of m-payment services adoption. This section will first discuss drivers, then consequences, and then put our research in place against the literature.

Our findings demonstrate that, to drive m-payment adoption, supervisory policy-makers have to orchestrate action across multiple levels: the company, customer, and country. On the company level, we confirmed prior research in that knowledge and skills are crucial for m-payment adoption (Duncombe & Boateng, 2009; Dzokoto & Appiah, 2014; Iman, 2018) and on the importance of employee training (Lee, 2020). This underscores the role of financial education programs for promoting m-payment adoption among the financially excluded of the population, such as people in rural areas, or people with low financial means and little access to higher education in general (Boateng & Afeti, 2019). Business users of m-payment services need to understand and get confidence in technology, and get help if required (Guo & Bouwman, 2016). This finding is in line with research that identified customer-facing IT capabilities as a prerequisite for large-scale m-payment services rollout (Du, 2018). Further, our study confirms that skills and formal qualifications drive m-payment adoption (Owusu, Bekoe, Addo-Yobo, & Otieku, 2020).

Our explorative study does not support the perspective that Tourism SMEs suffer from restricted access to financial investments (Mwai, 2016; Nguyen, 2009). According to our findings, Tourism SMEs in Rwanda face limited financial means but do not regard them as crucial for adoption. Instead, respondents had concerns about a potential lack of customer acceptance and the resulting lack in returns on m-payment-related investments. They foresee modest returns on investment per customer once they will have reached a critical mass of m-payment customers (Gao & Waechter, 2017; Mondego & Gide, 2018). We explain the lower importance of financial means of m-payment services adoption with technology scalability that allows companies to grow their m-payment customer base and the related investments simultaneously (Lacity & Reynolds, 2014; Stampfl, Pruegl, & Osterloh, 2013).

On the *customer level*, our qualitative evidence points to customer acceptance as a major driver of m-payment adoption. Further exploration of this driver suggested that customer acceptance is largely dependent on customers' privacy concerns, confirming what past research has found for other sectors than tourism (Anthony & Mutalemwa, 2014; Ha, Canedoli, Baur, & Bick, 2012; Kim, 2014; Oliveira, Thomas, Baptista, & Campos, 2016). The more secure and compliant with data privacy customers perceive m-payment services, the more likely they adopt the technology (Kang, 2018; O'Reilly, Duane, & Andreev, 2012; Park, Amendah, Lee, & Hyun, 2018). We also echoed past findings that awareness and familiarity with the technology are important for m-payment services use (Chogo & Sedoyeka, 2014).

This requires looking behind mere registration numbers, as many users will adopt a service but stop to use it (Etim, 2014; Kalba, 2016). In addition, like Tourism SMEs, customers of these companies face at least some costs for the initial adoption, as they have to purchase a phone that fulfills minimum technical requirements and need to pay the recurring costs associated with its connection.

Relating to both the *company* and *customer level*, our qualitative evidence points to further consequences of m-payment adoption. Successfully adopting m-payment leads to increased convenience and time-saving for both the company and customer, confirming what past research has identified as consequences (Choi, Seol, Lee, Cho, & Park, 2008; Dermish et al., 2012; Mbogo, 2010; Ngaruiya, Bosire, & Kamau, 2014). Overall, compared to paying cash, the convenience and time-saving of using m-payment translate into a better customer experience (Alfahl, Sanzogni, & Houghton, 2012; Omarini, 2018), which can further accelerate the adoption process. As found in prior works, the improved customer experience benefits companies by both increased retention of existing customers and the attraction of new customers (Gaur & Ondrus, 2012; Jocevski et al., 2020; Masocha & Dzomonda, 2018; Omarini, 2018; Staykova & Damsgaard, 2015).

On the *country level*, we identified drivers either as technology-related (viable devices, connectivity, and infrastructure) or regulation-related ('sandbox' regulatory frameworks, cooperation among m-payment stakeholders in the regulatory environment).

Not surprisingly, the low penetration of smartphones in Rwanda slows down the use of m-payment services in Rwandan tourism. At their usual price of 50 USD and below (Muvunyi, 2017), devices are still barely affordable for most people living in Rwanda. In addition, a smartphone imposes recurring costs in the range of a fifth of their average monthly income. However, those who have money to spend on tourism services and products (car rental, handcraft products, air tickets) wish to conduct the respective transactions via m-payment. Contrary to Makina (2017) and Duanea, O'Reilly, and Andreev (2014), in our case, the low penetration of smartphones appears only as a minor driver of m-payment adoption for Tourism SMEs, as m-payment services in Rwanda also work via SMS. Further, our work points to two other essential drivers: affordable Internet connectivity and more diverse telecommunication networks. Expensive access and frequent interruptions lead inevitably to dissatisfaction and lower acceptance of m-payment services among Rwandan Tourism SMEs (Oliveira et al., 2016).

Here, Rwandan Tourism SMEs face a vicious circle: as they fear not to recover their investment costs, they choose the cheapest available Internet connection. Provided by MMOs for 50-70 USD per month, it offers a low data transfer rate and suffers from frequent interruptions (Muvunyi, 2017). In turn, those interruptions negatively influence

business transactions and thereby reduce the opportunity to recover investment costs. Reliable connectivity is, hence, an important country-level driver of m-payment adoption. From a technical perspective, another essential driver is the availability of broadband infrastructure and payment equipment, as previous research has demonstrated (Ammar & Ahmed, 2016; Asongu, 2018; Hinson, 2011; Mago & Chitokwindo, 2014; Mlitwa & Tshetsha, 2012; Shrivastava, 2010).

With regard to regulation, we find that the government's strategy to combine a test-and-learn approach with a so-called 'sandbox' framework has encouraged and promoted innovation in the domestic market of tourism services. However, the supervisory policy-makers need to provide better assistance and foster interaction among players (Zetzsche et al., 2017). In line with Staykova and Damsgaard (2015), we find that integration and cooperation among Rwandan m-payment stakeholders is an equally important driver for the dissemination of m-payment services. Tourism SMEs demand a single m-payment platform, which would result in larger transaction volumes than the fragmented solutions in place (Carton et al., 2012; Petrova & Wang, 2013). Their request is in line with prior research that investigates the interplay of banks, mobile network operators, merchants, and start-ups in the context of digital payment platforms (Kazan & Damsgaard, 2014) or studies on issues related to the co-opetiton of banks and operators in m-payment ecosystems (De Reuver, Verschuur, Nikayin, Cerpa, & Bouwman, 2015).

Overall, our findings also point to the importance of a socio-material perspective on rolling out the technology, considering people and technology as deeply intertwined (Orlikowski, 2007). In the case of our study, solving technical problems is rather straightforward, with none of them requiring a solution that is not available anywhere on the market or not well established and tested. Furthermore, taking a multi-stakeholder theoretical perspective on technology adoption allowed us to draw a more holistic picture of the phenomenon than past research that has only analyzed m-payment services adoption from a single perspective.

Limitations and suggestions for future research

Our explorative study has several limitations. Future research may want to address these limitations and

- Extend the study to tourism stakeholders in urban centers or other emerging markets, which rely on high-quality user feedback (Merisalo-Rantanen et al., 2009).
- Investigate the technology and its interaction with business models in the tourism ecosystem. What are the main technological architectures employed for tourism-focused m-payment services in emerging markets? What are their respective strengths and weaknesses? Do they – technologically – represent state of the art and if not, why not?
- Examine the right balance between trust, security, and ease of use for different m-payment services, also considering the different standards familiar to domestic and foreign travelers.
- Further, examine the country-level consequences of adopting m-payment services.

Tackling some of our methodological challenges, future research may want to

- Complement our research design with a longitudinal, observational study. Focus groups of different Tourism SMEs and their customers could leverage their joint insight from multiple perspectives.
- Conduct quantitative studies on the impact of the different barriers- while keeping in mind the small number of Tourism SMEs in Rwanda with on average little specialized staff.
- Pursue a data science approach to studying drivers of the provision and the adoption of m-payment services to grow domestic and international tourism business. Such a study may want to start with all available data sets from the Rwandan tourism industry and look for explanatory patterns that shed light on m-payment barriers and enablers and their role in developing the tourism sector.

Implications and contribution

For scholars, practitioners, and policymakers, the implications of these findings are manifold. Firstly, we contribute toward knowledge on technology adoption in emerging markets. Secondly, having investigated m-payment adoption among Rwandan Tourism SMEs in the tourism industry, we have provided insights into the drivers and consequences of m-payment adoption for tourism in emerging markets. We are confident that our study contributes to the diffusion of m-payment and other ICT solutions, putting underdeveloped tourism sectors in a pole position for contributions to economic growth and national welfare (e.g., Asongu & Acha-Anyi, 2017; Heeks, 2010). Here, we conclude with three major implications for managers and policymakers derived from our research:

- Managers and policymakers must join their efforts to provide Internet connectivity at an affordable cost and foster interoperability among m-payment services. They should set incentives to encourage open innovation (Lee, Park, Yoon, & Park, 2010; Terwiesch & Xu, 2008) in their efforts to reduce cost, accelerate market readiness, and extend reach (Bosire & Ntale, 2018).
- Managers and policymakers should jointly develop digital platforms and standards for data security and privacy, implement measures to achieve compliance with privacy rules, and then actively communicate their efforts to raise awareness (Asongu & Boating, 2018; Humbani & Wiese, 2018), and in consequence, strengthen the use of m-payment among Rwandan Tourism SMEs and in related contexts.
- Concerning the 'regulatory sandbox', policymakers ought to dedicate additional resources (staff and funding) and set up a contact point – if possible, a clearinghouse – that enables Tourism SMEs to engage in case of arising challenges.

Disclosure statement

No potential conflict of interest was reported by the authors.

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6 Mobile Money Adoption in Rural Rwanda: A Domestication Perspective

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Mobile money adoption in rural Rwanda: A domestication perspective

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ABSTRACT

With this explorative research, we investigate if and how farmers in Rwanda adopt mobile money, or m-money, and integrate it into their everyday life to foster their economic development and social well-being. To this end, we adapt a domestication perspective and base our research on qualitative evidence from 72 semi-structured interviews with farmers in rural Rwanda. Our findings reveal that – where available – Rwandan farmers continuously domesticate m-money. While they acknowledge the convenience of using m-money, they experience three major inhibitors that particularly affect its use for business: (1) limited opportunities for learning about m-money, (2) high and non-transparent costs, and (3) barely accessible network agents with insufficient liquidity. Based on our findings, we discuss how policymakers and service providers can increase the adoption of m-money among farmers, thereby reducing social exclusion of the unbanked and fostering economic growth in Rwanda and other emerging economies.

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1. Introduction

It is widely recognized that the advancement of information and communication technology (ICT) has the potential to close voids in the financial system of emerging countries (David-West et al., 2019), thereby contributing to financial inclusion and poverty reduction. One of the most promising applications of the last years is mobile money, or m-money. It refers to an umbrella concept around the infrastructure and applications pertaining to m-payments (Azza & Azizah, 2015) and m-money transfers (Jenkins, 2008). M-money can replace traditional, insecure ways of sending and receiving money and hence may eliminate the risk associated with carrying cash in person (Kikulwe et al., 2014). Using m-money requires an m-money account charged through cash deposits either via agents or money transfers (Azza & Azizah, 2015). Once the account is set up and charged, people can use m-money, for example, to pay their bills.

New digital technologies – such as m-money – do not spread by themselves. Their adoption and use are contingent on numerous contextual factors that impact the speed and extent of users' adoption of technology (Ndemo & Weiss, 2017). M-money is among the technologies that – despite its advantages – has not gained ground in

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African countries to the extent desired by policymakers (Babatope & Mushunje, 2020). Nevertheless, with around 400 million accounts, sub-Saharan Africa has the largest number of registered m-money accounts in the world; most unbanked adults own a mobile phone (World Bank, 2020). Even though m-money usage is growing faster in Africa compared to other regions in the world (GSMA, 2019), low adoption persists across the continent (Kikulwe et al., 2014).

Past research has observed several inhibitors of m-money adoption and use: limited awareness (Chogo & Sedoyeka, 2014), failure of promotion campaigns (Kalba, 2016), a high registration-utilization gap with large numbers of users registering for the services but then discontinuing to use it (Etim, 2014; Kalba, 2016), and unintended use as well as fee-avoidance gaming techniques (Brinkman et al., 2009; Burrell, 2010; Kalba, 2016). Pointing to the relevance of a sociomaterial perspective on technology adoption and use stresses the need for addressing issues that otherwise lead to ignorance of technological solutions and, hence, waste of resources.

When studying m-money adoption and use, one major body of past research (Al-Jabri & Sohail, 2012; Ali & Dhaha, 2014; Chen, 2008; Mbogo, 2010; Oliveira et al., 2016; Osei-Assibey, 2015; Phonthanukitithaworn et al., 2016; Rumanyika, 2015) has taken the perspective of innovation diffusion theory (Rogers, 1995) or the technology acceptance model (Venkatesh et al., 2003). Both perspectives have been criticized for their technological determinism that views technology as a "fix" to or "change agent" for social problems (Hynes & Richardson, 2009; van Dijk, 2005). Another major body of past research takes an exclusive focus on the company or country as units of analysis (Jocevski et al., 2020; Lai & Chuah, 2010; Lu, 2019; Ozcan & Santos, 2015; Sorensen, 2018). Particularly in the context of m-money adoption in emerging countries, however, technology acts more as a social fabric (Webster, 2014), and its study must take a unitary view of people, technology, and systems (Orlikowski, 2007). Researchers have increasingly shifted their theoretical perspectives accordingly and started to study the social embeddedness of ICT through lenses of "Social Construction of Technology" (Bijker et al., 1987, 2012) or "Sociomateriality" (Orlikowski & Scott, 2008). Domestication theory (Haddon, 2011; Silverstone, 2007; Silverstone & Haddon, 1996) has emerged as another theoretical lens for the study of ICT adoption and use. It considers the social acceptance and appropriation of new technologies (Silverstone, 2007). Domestication theory also views the adoption and use of ICT as a social process rather than a specific event (e.g. Haddon, 2011; Silverstone, 2007; Silverstone & Haddon, 1996). The theory enables researchers to understand technology use "in the complex structures of everyday life settings, with attention to interpersonal relationships, social background, changes and continuities" (Hynes & Richardson, 2009, p. 486). By its broader perspective of social embeddedness of ICT, domestication theory addresses essential concerns of the more technocentric innovation diffusion theory (Rogers, 1995) and the technology acceptance model (Venkatesh et al., 2003), such as the limited explanatory and predictive power (e.g. neglect of self-regulatory and social aspects of user behavior), simplistic view of system use, and partly arbitrary predictors (Benbasat & Barki, 2007; Lim, 2018).

Concerning m-money adoption and use in emerging countries, past research has recently started providing insights into the underlying social dynamics and adoption drivers (e.g. Uwamariya et al., 2020). Developing a deeper understanding of ICT adoption and use in general, m-money adoption and use, in particular, are relevant in the context of

Africa. Despite significant prosperity in some areas of the economy, as in Kenya, large parts of Africa still face extreme poverty to a greater extent than other regions of the world (Beegle et al., 2016) and suffer from low financial development (Tchamyou & Asongu, 2017). ICT serves as an important lever for reducing income inequality and improving financial development if the underlying social dynamics are fully understood.

Hence, we pose the research question: *From a domestication theory perspective, how do farmers in rural Rwanda adopt and use m-money in their everyday life?* For answering this question, we take the broader perspective of social embeddedness of ICT and investigate m-money adoption – applying domestication theory (Haddon, 2011; Silverstone, 2007; Silverstone & Haddon, 1996) as the major theoretical perspective.

This allows us contributing to the literature on domestication as a framework (Haddon, 2011; Silverstone, 2007; Silverstone & Haddon, 1996). We demonstrate how technology adoption and use manifest (Brinkman et al., 2009; Burrell, 2010; Chogo & Sedoyeka, 2014; Etim, 2014; Kalba, 2016) and highlight the importance of the social construction of technology adoption and use (Tobbin, 2013). Thus, we confirm that innovation from technology lies at the intersections between social innovation, technological innovation, and institutional innovation (David-West et al., 2019). In particular, we also answer recent calls for research on the impact of digitization on the daily life and autonomy of farmers (Rotz et al., 2019), on reasons for resisting digitization, and on the interactions between farmers' "digital" and "analog" worlds (Klerkx et al., 2019). On a higher level, we contribute to the discussion on m-payment and its impact on economic and societal development (Avgerou, 2008; Heeks et al., 2008; Liébana-Cabanillas et al., 2017; Uwamariya & Loebbecke, 2020; Walsham, 2010).

For practice, our work provides important implications for orchestrating a technology rollout to more effectively allocate resources and achieve higher market efficiency. In particular, we show that policymakers should subsidize the mobile financial system to better include less wealthy farmers. Reworking pricing schemes for m-money and the related services will contribute to the fairness and transparency of markets and thereby reduce unintended use of m-money services. In particular, our findings suggest that relying on well-trained field workers instead of highly specialized technical personnel contributes more strongly to financial inclusion in rural areas.

The remainder of this paper is structured as follows: section 2 introduces the research context. Section 3 introduces domestication as a theoretical perspective. Section 4 describes the research design and data collection. Sections 5 states our main findings, and section 6 discusses our findings and concludes. Section 7 highlights implications for m-money adoption and use, and section 8 presents study contribution, limitations, and outlines some opportunities for future research.

2. Research Context

2.1. The Financial System and M-money in Emerging Countries

Globally, about 2.5 billion people, in rural areas, never use any formal financial services (globalfindex.worldbank.org). As most financial institutions operate for-profit, they concentrate in urban zones (Munyegera & Matsumoto, 2016). Their networks are thin in rural areas populated with rather poor people, who save small amounts of money

(Beck et al., 2008). The lack of basic financial services limits the rural population's ability to invest in their living, protect their assets, manage risks, and step out of poverty (Adeleye et al., 2019; Dupas & Robinson, 2013). Most rural households rely on insecure ways to send and receive money. They use public transportation or rely on friends as couriers to carry their money to the wanted destination. Further, they keep their savings as cash under the mattress or in the form of jewelry (Dean et al., 2014; Kikulwe et al., 2014).

Of the 2.5 billion people excluded from professional financial services more than one billion have access to a mobile phone (GSMA, 2015), which allows for affordable and cost-effective access to financial services (Donovan, 2012) such m-money.

The m-money concept has received considerable attention in the last decade from practitioners and academics (Godfried & Azerikatoa, 2017). It plays a vital role in lower-income nations where the banking infrastructure is insufficient or non-existent (Aker & Mbiti, 2010; Jack et al., 2013). M-money facilitates financial transactions through affordable payment systems. Where households often rely on remittances from family members (Donovan, 2012; Jack et al., 2013), m-money eliminates the risk associated with carrying cash in person (Kikulwe et al., 2014). Occasionally, it also facilitates access to health insurance services (Hove & Dubus, 2019; Jack & Suri, 2014). By increasing financial inclusion, m-money adoption and use lead to the absorption of financial shocks, reduce poverty, and foster economic growth (Batista & Vicente, 2018; Habyarimana & Jack, 2018; Hove & Dubus, 2019).

Previous researchers have also confirmed that mobile phone technologies enhance the livelihoods of rural communities in developing countries. Murendo et al. (2015) found that the adoption of new mobile technologies has the potential to increase agricultural productivity. In their study on the effects of information service on crop varieties, Kirui and Onyuma (2015) noted that information received through mobile phone assists farmers to increase their yields. Moreover, Batista and Vicente (2018, 2020) show that the randomized introduction of m-money in rural areas of Mozambique decreased the transaction costs of migrant remittances so that these improved insurance to shocks and prompted increased migration out of rural areas.

M-money adoption varies across countries (Suri & Jack, 2016). Several governments across Africa use m-money platforms to transfer cash to their citizens' mobile accounts as a palliative response to COVID-19 (World Bank, 2020). However, despite the enormous opportunities m-money offers its users, several factors tend to prevent its widespread adoption.

Related empirical research in East Africa has focused on fostering household income in Kenya (Kikulwe et al., 2014), per capita consumption (Munyegera & Matsumoto, 2016), or food security (Murendo et al., 2015) in Uganda. In Rwanda, m-money is still at the nascent stage (Uwamariya & Loebbecke, 2020). Most Rwandans rely on informal financial services and perceive cash as a superior and "cost-free" form of money (Gasheja & Harelimana, 2016); however, little progress has been made to increase the adoption and use of m-money services among low-income citizens.

2.2. M-money Use in the Agricultural Sector of Rwanda

Rwanda is an emerging economy aspiring to become a middle-income country and an Information and Communication Technology (ICT) hub in the East African region by 2020 (Rwanda Ministry of Youth and ICT, 2015).

Most m-money services in Rwanda build on the Short Message Service (SMS), not requiring smartphones. In collaboration with international "FinTech" providers, mobile network operators offer m-money services that allow customers to transfer money between their mobile account and their bank account, and to many other African countries (National Bank of Rwanda, 2018). Occasionally, m-money services are connected to services at the point of sale to enable customers to pay for goods and services via mobile phones.

Triggered by the success of Kenya's M-Pesa system (Mbiti & Weil, 2015; Morawczynski, 2009; Uwamariya & Loebbecke, 2019), m-money services in Rwanda were developed and launched in a close interplay between banks, companies of the financial sector, and governmental organizations. MTN, the country's largest telecom provider, introduced the first m-money service in 2010. The two providers, Tigo and Airtel followed by offering their m-money services in 2011 and 2013. By 2018, 74% of the Rwandans had registered for the system (National Bank of Rwanda, 2018); 49.5% are active subscribers (National Bank of Rwanda, 2018), but only 25% of those use it for paying bills (National Bank of Rwanda, 2018).

Two entities in Rwanda share supervision: the Rwanda Utilities Regulatory Authority, which regulates the telecommunication sector, and the National Bank of Rwanda, which oversees financial services. To attract local and international "FinTech" businesses, Rwanda pursues a "sandbox" approach to regulation: it allows innovators to test novel business ideas with limited legal liabilities under relevant regulators' supervision (Zetzsche et al., 2017). Thus, regulators stay informed about industrial developments and re-examine and revise their regulations accordingly (Wechsler et al., 2018).

So far, most m-money users are residents in urban areas (Gasheja & Harelimana, 2016) – leaving the enormous potential for financially including households in remote areas (Jack & Suri, 2016; Munyegera & Matsumoto, 2016). To help the agricultural sector, the Government of Rwanda aims to digitize the agricultural value chains via mobile devices and services to improve agricultural practices (Ministry of Agriculture and Animal Resources, 2009). The idea is to move Rwandan agriculture to a knowledge-intensive, market-oriented sector – by adding value to products and thereby sustaining growth (Ministry of Agriculture and Animal Resources, 2013).

72% of the Rwandan working population lives on agriculture (Food and Agricultural Organization, 2018). The agricultural sector generates 33% of the national GDP (Food and Agricultural Organization, 2018). Hence, farming plays a central role for commercial purposes in rural areas next to handcraft activities, small-scale mining, or pure subsistence. Rwanda's stable climate and predictable precipitation patterns allow for two crop cycles per year. Main agricultural products are roots and tubers (27% of the agricultural production), followed by cassava (7%), sorghum, beans, corn, wheat, and some rice. Coffee and tea are the primary agricultural export products produced for export but account for 2.4% and 1.6% of the country's overall agricultural production (Ministry of Agriculture and Animal Resources, 2013).

In Rwanda, introducing m-money services ought to mediate some of the challenges such as theft, fraud, costs, and logistics, which farmers face when operating with cash in daily business (Food and Agricultural Organization, 2018).

Source: After Silverstone et al. (1992): 21-26

Figure 1. Four phases of domestication.
Source: After Silverstone et al. (1992, pp. 21–26).

3. Domestication as a Theoretical Perspective

The domestication perspective refers to how users get familiar with various new ideas, eventually leading to their appropriation (Haddon, 2011; Silverstone, 2007; Silverstone & Haddon, 1996). It enables theorizing about knowledge acquisition and the users' tendency to integrate an innovation by explaining the users' knowledge level about it at various phases (Chandra & Chen, 2019).

The process of domestication means different things to different actors (Sam, 2015). To designers or creators of technological innovation, it refers to the consumption or utilization of innovation. To ordinary users, it refers to everyday life procedures (Hynes & Richardson, 2009).

A technology-deterministic view considers technology as an autonomous, distinct, and radical change agent of society (Hynes & Richardson, 2009). In contrast, domestication captures the dialectic process involved in human interaction with technology (Sam, 2015). Early studies applied domestication to television and telephones – early physical artifacts in domestic settings (Haddon, 2006). Newer research has expanded the domestication lens to cover more general technology adoption (Langdridge, 2007).

The domestication perspective differentiates four phases (see Figure 1) – appropriation, objectification, incorporation, and conversion (Silverstone et al., 1992; Silverstone & Haddon, 1996), where each phase relies on social dynamics that may differ depending on the context in which domestication takes place (Lim & Soon, 2010).

Appropriation phase. It covers how users familiarize themselves with the technology (Silverstone, 2007). The phase involves accepting the technology – likely influenced by the individual's cognitive, affective, and social state (Tobbin, 2013). At the appropriation moment, consumers become aware of a technology, product, or service and decide to appropriate or defeat it. Both the innovation at hand and the communication channels used to influence the adoption rate.
In the case of m-money, service operators deploy national advertising campaigns in television, radio, on billboards or busses, and via social contacts to make users aware of the innovation. Adoption happens more likely in the vicinity of existing users as potential new consumers often learn about innovations from their neighbors (Jansson et al., 2017).

Objectification phase. It illustrates how technology takes its place within the household or the individual's everyday life (Hynes & Richardson, 2009; Tobbin, 2013). The objectification is not confined to material objects as services can also be objectified (Tobbin, 2013). The objectification of a service refers to the space given to the object that carries the service (Hynes & Richardson, 2009; Lim & Soon, 2010).

	The objectification of m-money occurs during the initial testing of m-money services when farmers experiment for the first time – via their mobile phone – with m-money before they finally adopt or reject it (Brown et al., 2003). The availability of an agent, who is necessary to perform basic actions such as withdrawals and deposits (Ngugi et al., 2010), as well as registration costs and transaction fees (Tobbin, 2013) impact the perceived usefulness and ease of use and hence the adoption decision (Micheni et al., 2013; Venkatesh et al., 2003).
Incorporation phase.	It describes how individuals utilize a technology (Hynes & Rommes, 2007), how they interact with it, and how they benefit from it (Chandra & Chen, 2019; Lubua & Semlambo, 2017; Micheni et al., 2013). After reflecting upon the first experiences with m-money services, farmers decide to which degree they embed such services into their daily routines – replacing or supporting previous ones.
Conversion phase.	It explains the relations between users and the social environment, including relatives, friends, and neighbors. Concerning the conversion phase, we investigate how users perceive a technology socially (Silverstone et al., 1992), whether m-money serves as a status symbol and helps to express group affiliation (Hynes & Richardson, 2009).

4. Research Design, Data Collection, and Data Analysis

4.1. Research Design

As this research is exploratory by nature, we employ a qualitative research design to understand how people adopt m-money into their lives (Kleine, 2013) and which role social dynamics might play in each phase of domestication. From collecting qualitative evidence on people's experiences, a qualitative research design offers an effective way to understand people's complex realities (Scheyvens, 2014) and were already successfully employed in adjacent research contexts (Blankson & Nukpezah, 2019).

Qualitative research is commonly interpretative and aims at understanding a phenomenon that can inform other research settings (Myers, 2013). With this work, we aim for analytic generalization, i.e. to produce results that have implications beyond the studied research setting (Myers, 2013). To this end, an explorative, interpretive approach is appropriate for investigating the m-money adoption of farmers in rural Rwanda from a domestication perspective, because it recognizes the importance of the participant's context in interpreting their lived experiences (Croucher & Cronn-Mills, 2014).

Domestication theory sets the scope for collecting our qualitative data. As we aim at maximizing respondents' freedom to bring up any kind of evidence related to the four phases of domestication, we considered semi-structured interviews most appropriate to collect data. Also, we decided not to incentivize participants monetarily to not bias their answers regarding what a government rolling out the technology would like to hear. We set up the following catalog of questions to guide our semi-structured interviews (Table 1).

To compile a list of interviewees, we used purposive sampling and relied on our judgment and local knowledge to locate farmers in rural Rwanda for interviews (Krippendorff, 2013; Smith et al., 2009). We decided to look for interviewees in three areas – named

Table 1. Interview questions.

Phase	Questions
Appropriation	• Do you feel influenced by marketing efforts (e.g. running advertising campaigns) to adopt m-money services? • How have you been influenced by social contacts to adopt m-money services?
Objectification	• How familiar are you with the fee structure of your m-money account? • Do you consider m-money services cost-effective, and why so? • Are you satisfied with your agent's availability and helpfulness regarding m-money services – why or why not?
Incorporation	• Which m-money services do you use? • Which benefits do you obtain from adopting and using m-money services?
Conversion	• To what extent does m-money serve you as a status symbol, and if so, how? • To what extent does m-money allow you to express your group affiliation, and if so, how?

"Rilima", "Mwogo", and "Shyara" – of the Bugesera district in Rwanda. For the initial contact, we located the farmers via personal contacts and got addresses from the phone book. After drawing a base sample of 81 farmers, we briefed them on our study purpose and then individually asked them whether they would be interested and willing to participate in our study. In total 72 of 81 farmers agreed to support the study. All participating farmers had subscribed to m-money services before the interview. Some had also experimented with some ICT applications to strengthen agricultural productivity (Food Security Support Project in Bugesera, 2015).

Overall, we interviewed 72 farmers (Table2).

4.2. Sample Characteristics

Overall, we had interviewed 42 female and 30 male farmers. They had an average age of 30 years. Their households' median disposable income was RWF 350,000, which equals USD 375 as of May 2020. While seven farmers had no formal education, 38 had passed primary education. 27 had completed a secondary education certificate, for instance, through a vocational training unit or a school from the general education system. None of the participants had completed tertiary education. The farmers described their employment status as either self-employed (52) or dependently employed (20). While 67 farmers gained most of their monthly income from farming, five did farming as a side job. On average, participants had pursued their farming activities for four years.

4.3. Data Collection

We conducted semi-structured, in-depth interviews in January and February 2019 to elicit a vivid picture of the interviewee's perspective on the research topic (Mohajan, 2018). The interviews allowed us to explore people's thoughts, opinions, beliefs, experiences, and motivations around a particular subject (Smith & McCarty, 2017). Since all interviewees

spoke the local language Kinyarwanda, one of the authors fluent in this language conducted the interviews. By interviewing participants in the local language, we aimed to eliminate any biases and misunderstandings that would have been likely if we had conducted interviews in the farmers' second language, such as French. To record interviews, we took notes on paper and – upon permission – recorded audio with our smartphone in some cases. During the interviews, there were no people present apart from the group of farmers we interviewed. Our questions addressed interviewees' domestication of m-money. The questions were partially closed and partially open-ended (see Table 1); this allowed participants to point us to aspects they considered important, and it granted us the flexibility to probe deeper into participants' new ideas or emerging issues. For major aspects raised by the interviewees, we triangulated statements by posing questions from different angles. We briefed interviewees on the research purpose and explained that they were free not to respond to any question. In one case of an unforeseen interruption, we continued with the interview session about 90 min later. We considered an interview complete as soon as all farmers in the group had comprehensively expressed their views on all nine questions. The average interview session per group of interviewees took 2.5 h (see Table 2), including the introduction and briefing phase. Right after the interviews, we scanned our interview notes into a computer and physically archived sheets into a folder.

4.4. Data Analysis

Before the data analysis, one of the authors who are highly familiar with qualitative research trained the fellow authors about coding qualitative data. This training took 2.5 h. To analyze the data, we used thematic analysis, a method to derive patterns of meaning from our qualitative evidence (Saunders et al., 2016). During and after the interview sessions, one of the authors, with the help of a local staff assistant, transcribed the interviews (Mohajan, 2018), broke the transcripts down into manageable sections, and clustered similar data into categories (Noble & Smith, 2015). To ensure interpretive rigor, we performed several iterations between the categories and the related interview transcripts to confirm that the transcripts fit the categories well and the categories cover the transcriptions comprehensively. Themes and categories were generated inductively. We then sorted the categories and grouped them further to generate themes and subthemes related to the four phases of domestication of m-money (Saunders et al., 2016). We discussed the results of the coding among the authors; to ensure the credibility and reliability of the data analysis, we checked whether qualitative evidence was

Table 2. Profile and geographical distribution of interviewees.

Geographic sector	Interviewees	Product	Duration per interviewee group
Ririma			
Group A	12	Irish and sweet potatoes	2:10 h
Group B	18	Cassava	2:30 h
Mwogo			
Group C	20	Irish and sweet potatoes	3:15 h
Group D	8	Cassava	1:45 h
Shyara			
Group E	14	Cassava	2:30 h

supported by several statements – to not overemphasize extreme positions mentioned by a single farmer. We also discussed cases that were partly ambiguous with regard to their codification until we reached a consensus within our team of authors.

5. Findings

This section offers the findings from our explorative research and organizes them along the four phases of domestication introduced above.

5.1. Appropriation Phase of M-money Domestication among Farmers in Rural Rwanda

A free, fast, and simple registration for the m-money services is a precondition for farmers in rural Rwanda acquiring m-money services. For the initial adoption, it is not sufficient to give farmers information on m-money services or instructions on how to use them. Helpful are technology-literate relatives or friends who are familiar with the services and can help to experiment with and initially adopt the m-money services.

To get started, a farmer needs a national ID – in contrast to the more rigorous documentation requirements for opening a bank account – and then go through a short process that takes less than three minutes. There is no required minimum balance.

With regard to the appropriation, interviewees stated:

> *I learn a lot when I go to work. In our village, there is a TIGO wall-advertisement, but I don't have time for that.* [Farmer Group E, Shyara, 2019]

> *I am the kind of learner who has to try. If I don't try it, I don't learn it. Don't just give me instructions. I want someone to sit with me to take me through the stuff. Best is if I can I be with my son when he shows me.* [Farmer Group B, Ririma, 2019]

> *Probably the only reason why I have an m-account is that my wife subscribed to it. Otherwise – who knows whether I would have paid attention – maybe yes, maybe no. It is her influence. She is a genius when it comes to ICT stuff.* [Farmer Group C, Mwogo, 2019]

Interviewees question the usefulness of television, radio, and outdoor advertising campaigns to raise awareness of m-money. While most interviewees have access to radio and mobile phones, they do not watch television. A few farmers follow advisements through print adverts.

> *To me, most of the advertising messages that I receive on my mobile phone are irrelevant … I don't see any point in checking them. My daughter taught me how to use mobile money.* [Farmer Group B, Ririma, 2019]

5.2. Objectification Phase of M-money Domestication among Farmers in Rural Rwanda

The adoption of m-money depends on the farmers' costs for using the service and their understanding of the fee structure in rural Rwanda. Interviewees cite costs as a primary reason for limiting their m-money use. While registration is free with all m-money providers, farmers must acquire a SIM card or upgrade their existing one. Most interviewed

farmers barely understand the actual charges they must pay. They do not find them clear and transparent because, in Rwanda, m-money providers do not disclose a money transfer price before or after a transaction is complete.

> *I am unable to check the cost of sending a payment; every time I have to manually calculate the cost of the transfer. This not only costs time and money. It also requires a level of financial awareness and expertise that many of us may simply not have; this is frustrating.* [Farmer Group D, Mwogo, 2019]

> *I would use my m-money account to also pay for electricity or water. But I don't, because I do not know exactly how much a transaction costs. So, I prefer paying with cash.* [Farmer Group A, Ririma, 2019]

> *I do not know exactly how much it costs to use my m-money service, but it feels expensive. I struggle a lot to earn the money and then when I send a small amount, they charge me … I don't like that.* [Farmer Group E, Shyara, 2019]

> *I do not want to receive any payments for my cassava via m-money. It is too expensive. My clients have to pay when they give me the money and I have to pay when I want to withdraw some amount. I feel it is a lot of money.* [Farmer Group B, Ririma, 2019]

Regarding agents, farmers also struggle with their insufficient availability. The farmers describe visiting an m-money agent as a challenge because the nearest one is typically five or six kilometers and up to two hours away by foot. Paying for public transportation or a taxi to see an agent makes the m-money service even more expensive and inconvenient that farmers abandon the service.

> *If I decide to use m-money, I have to come to town for every transaction. We do not have m-money services in our village.* [Farmer Group A, Ririma, 2019]

> *I registered for m-money services, but I do not use them a lot. Agents are too far away and the network signal is weak and often interrupted.* [Farmer Group C, Mwogo, 2019]

> *I would save on my m-money account. But what do I do when I need my money and there is no agent? Where am I going to access my money?* [Farmer Group D, Mwogo, 2019]

Farmers are confronted with agents who do not have enough cash. The agents' solvency is vital in the context of cash pay-outs and for completing a transaction.

> *Sometimes, cash inadequacy is a problem, when agents are not able to provide sufficient cash when I need it urgently.* [Farmer Group B, Ririma, 2019]

Difficulties in charging mobile phones also present a barrier to objectify m-money services among farmers in rural Rwanda. They appreciate the opportunity to charge their mobile phone while visiting the agent as most phone owners alternatively charge their phones at locations where they must pay for it.

5.3. Incorporation Phase of M-money Domestication among Farmers in Rural Rwanda

Farmers in rural Rwanda rather use m-money for private transactions than for business ones. They send money to their relatives and friends but rarely use m-money for their farming businesses. Handling payments for agricultural products via m-money is not

common among farmers of Bugesera due to limited access to agents and their insufficient liquidity.

> *When you have a salary, it is difficult to deny a relative's or neighbor's request for money. But I'm glad I have it and be able to help.* [Farmer Group E, Shyara, 2019]

> *I decided to get an m-money account because of my children. Before, I had to travel to pay their school fees and give them some pocket money. Now I am using m-money; it is much simpler than our usual method of transferring money – I like it a lot!* [Farmer Group D, Mwogo, 2019]

> *When I have an emergency, I notify my children who work in towns and they send me money through TIGO cash – it does not happen often, but it is very helpful when it is needed.* [Farmer Group C, Mwogo, 2019]

> *I use m-money for small amounts to help my family or friends. For my business, I prefer the banks.* [Farmer Group E, Shyara, 2019]

Considering loans and savings, m-money has a mixed reputation. Taking small loans from a friend or relative via m-money mostly happens at the community level. It is a common practice in the villages. In contrast, farmers barely take loans via m-money from financial institutions. Savings on m-money are rare among farmers, who mostly prefer to keep a small balance on the phone for their short-term demand. Some farmers acknowledge the importance of keeping a larger amount of their savings in m-money to meet future expenses.

> *Well, I decided to save a little bit, but then everything got spent on illness and small things.* [Farmer Group B, Ririma, 2019]

> *My provider, MTN, does not give any interest in our money. That is why I save larger amounts in my bank's account.* [Farmer Group D, Mwogo, 2019]

> *I want to make sure that I have some money for offering to my church; it is important to me. So, if I put small amounts in my m-money account, at the end of the week, I have enough to offer it.* [Farmer Group C, Mwogo, 2019]

Farmers who have tried the m-money agree that it saves time, reduces transport costs, and provides quick access to funds in the case of an emergency.

> *I can take some money any time in case of some sickness in the family. I can just withdraw the needed sum and take her to the hospital.* [Farmer Group B, Ririma, 2019]

> *I think it is a good idea to keep some money in my account. In case a spontaneous visitor comes, I can quickly send a little money and pay for the transport without having to leave my work.* [Farmer Group C, Mwogo, 2019]

Furthermore, m-money empowers female farmers. Having access to mobile phones and m-money services liberates them from their husbands' control and monitoring.

> *M-money gives us women some control. Previously, when my son in Kigali (capital of Rwanda) sent us some money and my husband would spend it on beer. When I ask him for the money to buy food, he always says, "I don't have money", and that money is not my business. When I discovered that I can open my own m-money account, it became much easier. Now I receive the money directly from my son. With that, I have developed our home a lot. I bought green grams' seedlings and paid school fees for our smaller children.* [Farmer Group E, Shyara, 2019]

5.4. Conversion Phase of M-money Domestication among Farmers in Rural Rwanda

For farmers in rural Rwanda with tertiary education, using m-money translates into public recognition; however, very few farmers had the opportunity to attend higher education.

> *You know, I am educated. I have a bachelor's degree. I must show my community that I can do it; that I know how to take advantage of advanced technologies* [Farmer Group D, Mwogo, 2019]

> *In meetings, others usually ask us how the m-money system works. They think we learned it at university. It is very interesting; they listen to us. This shows the importance of education.* [Farmer Group A, Ririma, 2019]

> *Not all of us have an education, most of us are farmers. We just need basic features – for receiving money and sending some to our relatives.* [Farmer Group B, Ririma, 2019]

In summary, we identified an insufficient understanding and transparency of the fee structure and limited access to learning, for instance, from technology-literate relatives or friends, as major inhibitors of m-money adoption and use. Also, insufficient availability and solvency of agents and high overall direct (e.g. for making a payment) and indirect (e.g. for paying the bus to visit an agent) costs, as well as a lack of power charging opportunities for the phone, limit adoption and use among farmers as an important group of the population in rural Rwanda. From our findings, we can conclude that domestication has occurred to a limited extent, with the number of m-money adopters and users decreasing with each domestication phase.

6. Discussion and Conclusion

Taking a domestication theory perspective, our research points to the main benefits of using m-money in rural areas and draws attention to hampering factors, as m-money has not yet found a place in farmers' daily life structures and routines. We start our discussion by reflecting on our main findings concerning the four domestication phases against insights from previous research.

Appropriation phase. In line with previous studies (Pedersen, 2005; Sheikh, 2013; Waweru, 2017), we found that literacy and experience regarding technology – and m-money in particular – foster the adoption. Particularly noteworthy are personal recommendation networks along family or friendship ties. Being informed and "educated" about m-money by family or friends who already use m-money plays a vital role for farmers, who contemplate adopting m-money and use m-money transfer services. Existing m-money customers with high m-money affinity can trigger m-money adoption by other farmers; they often happily convey their insights on building a business relationship with frictionless financial transactions. Although awareness influences the adoption of m-money services (Jack & Suri, 2011), we also found that farmers barely recognize the m-money services. We agree that media can contribute to the initial awareness (Silverstone, 2007); however, according to our study, further downstream domestication activities rely more on individuals' social ties than mass media.

Objectification phase. As farmers complain about too high costs, further efforts concerning the fees and cost transparency are needed to promote the adoption of m-money in Rwanda. Different institutions and researchers (GSMA, 2019; Shem et al.,

2012) illustrate the successful promotion of m-money with a "no fee" model for cash withdrawal and transfer in rural regions in Uganda and Tanzania. Other promising measures include providing affordable electricity and securing accessible agents equipped with sufficient liquidity (Alampay & Cabotaje, 2016). While both the availability of agents and their liquidity are facilitating conditions for the success of m-money (Hoofnagle et al., 2012; Nuwagaba, 2014; Otieno et al., 2016), our study shows that not enough agents are accessible in the villages. Limited liquidity hampers their ability to execute financial transactions, particularly during market days. In line with Sheikh (2013), we identified the electricity supply and mobile network signal as barriers to m-money adoption during the objectification phase. The deployment of solar panels to produce electricity for charging mobile phones could allow farmers to use m-money services more continuously (Mutisya & Wambui, 2016).

Incorporation phase. Our findings suggested that time saved is one of the top benefits of m-money incorporation and usage. Easy access and cost savings were also repeatedly brought up by the interviewees, similar to findings in other studies (Gosavi, 2015; Kirui & Onyuma, 2015). The difficult access to traditional banks in Rwanda amplifies the benefits of using m-money. Especially women may benefit from m-banking, as it could pave their way into financial independence with less control from their husbands. However, we also found that so far m-money is barely intertwined with the everyday activities of most study participating farmers. Often, they are unwilling to receive their businesses' payments through m-money – again due to insufficient agent proximity, availability, and liquidity. Thereby, we confirm similar research (Kirui & Onyuma, 2015) that residents in rural areas sometimes use m-money to exchange funds with relatives and friends, they barely adopt other services such as bank transfers, purchase payment, and savings.

Conversion phase. Our findings show that the ability to display m-money often follows education and economic well-being. This is in line with Murendo et al. (2015) who likewise found a positive association between education and economic comfort on the one hand and technology adoption on the other hand.

Overall, in the appropriation and objectification phases, the extent of initial m-money adoption depends on how far the immediate social environment can raise awareness and educate a farmer about m-money and its benefits. Neighbors and friends more important than any information and education by media. After that, services must be affordable, agents accessible, and electrical charging opportunities and mobile network signals provide the right context for m-money adoption.

The extent of m-money use depends on whether the services save time, money, are easily accessible, and – most importantly – can be deeply intertwined with everyday activities. Lastly, higher formal education may foster m-money use. It increases the learning curve and exerts peer pressure as people rather expect familiarity and use of m-money services from peers with higher formal education.

Overall, the factors that inhibit or promote technology adoption are not on the technology but the social and policy level (Majchrzak et al., 2016). For farmers in rural Rwanda, social enactment is of superior importance compared to the technological level. Hence, to facilitate the m-money adoption and use, providers or politicians do not have to rely on well-trained and highly specialized technical personnel. In rural Rwanda, trained fieldworkers who interact with the farmers uncover social and political issues that hinder the adoption in any of the four domestication phases.

7. Implications

Any change in a country's financial system is only sustainable with a holistic approach (Amaeshi & Idemudia, 2015). To leverage the potential of m-money for "social logistics", policymakers, and other entities involved in the adoption and use need to take as many different perspectives as possible (Tenhunen, 2008). Integrating the different perspectives into an orchestrated approach would prevent individual "workarounds" or the emergence of an informal financial sector (Mhando, 2018).

Policymakers should safeguard the adaption and use of m-money; their increased awareness likely decreases m-money users' fear of unwanted exploitation. Furthermore, they ought to design and oversee the cost structure and overall cost associated with m-money adoption and use. As we identified both as major inhibitors, policymakers may want to seek ways to subsidize the mobile financial system and facilitate access for less wealthy farmers. The policymakers should oversee that pricing schemes for using the related services are fair and transparent and do not lead to any unintended use of m-money services.

Also, policymakers need to pay attention to encouraging m-money adoption in different regions within the country. Offering material and training in local dialects and educating the financially illiterate about the benefits of the system likely enhances a broader adoption. Increased user-authority interaction can leverage feedback to improve m-money services.

Although we found that overall, the factors that inhibit or promote technology adoption are on social and policy level, a certain technological availability is also a "must have". Hence, on the technological level, the policymakers involved in m-money adoption and use need to pay attention to the quality of the infrastructure. As financial inclusion mainly addresses the less wealthy society members, those users most likely live in areas with poor infrastructure (Adeleye et al., 2019; Mothobi & Grzybowski, 2017).

To foster m-money services among Rwandan farmers, service providers need to ensure a distribution network with properly incentivized agents. Furthermore, instead of relying on well-trained and highly specialized technical personnel, trained field workers – in dialogue with potential customers – could effectively gain new customers. In each of the four domestication phases, they could uncover issues that hinder or prevent m-money adoption in rural parts of the country.

8. Study Contribution, Limitations, and Future Research

This study contributes to a better understanding of m-money adoption and uses along the four phases of domestication – appropriation, objectification, incorporation, and conversion (Haddon, 2011; Silverstone, 2007; Silverstone & Haddon, 1996). Understanding users' attitudes and behavior along the four phases of domestication is essential because it provides a more granular picture than adoption or use alone.

Taking the domestication perspective helps us better understand the social dynamics of technology adoption and use for inclusion and economic development in emerging countries. Our study thereby enriches the literature that has analyzed aspects of m-money adoption (Brinkman et al., 2009; Burrell, 2010; Chogo & Sedoyeka, 2014; Etim, 2014; Kalba, 2016) without providing insights on the fundamental underlying social

dynamics. We show that the Rwandan government has laid the ground to overcome gaps in technology, policies, and infrastructure. Disseminating technological innovations such as m-money has started to positively impact the country's economic development and national welfare.

We further showed that a comprehensive approach to the adoption and use of new technology, such as m-money services, is essential. It allows studying technology together with its social enactment (Orlikowski & Scott, 2008). Here, our study is in line with prior works finding that technology and social practices are mutually constitutive (MacKenzie & Wajcman, 1985). Technology use shapes social practices (Ndemo & Weiss, 2017; Tenhunen, 2008), and – at the same time – social practices shape technology use (Osei-Assibey, 2015; Tuwei, 2018). In our interviews, we found support for technology shaping social practices; for instance, when rural farmers use the opportunity of agent visits to charge their phone and thus spend more time in the surroundings of the agent's office. We also found support for the latter – social practices shaping technology, for instance, in the case of the wife who addressed her husband's irresponsibility in money spending and the financial transactions with her children via subscribing to m-money services.

Our study adds to a growing body of research that uses the domestication perspective as an analytical and theoretical framework. As requested by Rotz et al. (2019), it provides insights on how digitization impacts the life and autonomy of rural farmers; it explains why and how rural farmers partially resist digitization, and it sheds light on farmers bridge between their "digital" and "analog" worlds (Klerkx et al., 2019). To the best of our knowledge, it is the first application of the domestication perspective to m-money adoption among rural farmers. We thereby complement researchers (De Reuver et al., 2016; Hahn & Kibora, 2008), who used the domestication perspective to analyze mobile phone adoption but concentrated on the artifact per se, not on the mobile phone as a tool for accessing services. Hereby, this work spotlights the social dynamics immanent in the adoption and use of m-money services.

Based on our insights on how Rwandan rural farmers adopt and use m-money in everyday life, we have gained several insights regarding the m-money adoption and use along the four domestication phases. We can conclude that they offer six main benefits: (1) higher technological literacy, (2) higher financial awareness and transaction transparency, (3) improved capital fungibility, (4) more long-term planning, (5) lower dependence on "loan sharks", and (6) more time for core activities.

Higher technological literacy. Formally educating the rural population regarding the adoption and use of technology is rarely successful. Instead, the acquisition of knowledge and skills through peers contributes to mastering and appreciating the use of m-money services and technology in general.

Higher financial awareness. When implemented correctly, m-money services overcome several deficiencies of the traditional monetary exchange. By providing financial information in a digitized, aggregated, and transparent manner, the technology makes an important contribution to the rural population's financial awareness.

Improved capital fungibility. M-money increases the fungibility of capital and thereby enhances individual farmers' liquidity. If financial shortfalls arise within a family or group of neighbors or acquaintances, m-money can quickly compensate for the shortfall by moving money from more financially strong to weak individuals. In the long term, this is in the collective interest of the group.

More long-term planning. Widespread adoption of m-money allows farmers to plan in a more long-term oriented manner. Potential cash shortfalls could trigger actions that lead the farmer to try to "financially survive", e.g. by temporarily suspending the farming business and seeking work as day labor. It does not contribute to the long-term prosperity of the business. Having access to additional liquidity to compensate for periods of financial shortfalls can lead the farmers to act more long-term oriented and strategic.

Lower dependence on "loan sharks". M-money could make farmers less dependent on "loan sharks" who offer short-term financial liquidity for high interest rates. It could help commoditize the loan market which should drive down prices for loans, in terms of interest rates, assignment fees, and fees for the exchange between physical cash and non-physical checkbook money.

More time for core activities. Saving time on executing financial transactions in cash (e.g. carrying money in cash to the neighbor village or receiving it from there) would free up farmers and leave them with more time for their core activities around their farming business.

Our explorative study also demonstrates that further steps are necessary to harvest the potential benefits of a technological innovation such as extensive m-money adoption and use. It requires good institutions and regulatory environments and investment in education and infrastructure to reach the less educated, relatively poor farmers living away from urban innovation centers requires. Overall, we further contribute to past works that discussed how m-payment shapes economic and societal development (Avgerou, 2008; Heeks et al., 2008; Walsham, 2010) and complement studies that have focused on different units of analysis (Jocevski et al., 2020; Lai & Chuah, 2010; Lu, 2019; Ozcan & Santos, 2015; Sorensen, 2018).

Our research approach and data sources are associated with a few limitations and corresponding opportunities for future research. In this research, we conducted qualitative research to study farmers' m-money adoption in rural Rwanda. While farming is a distinctive activity for rural areas in Africa instead of more urbanized areas, people in rural areas might complement commercial farming activities with other activities or not engage in farming at all. Future research should study whether our findings also apply to people engaging in handcraft activities, small-scale mining, or pure subsistence activities – all of which are also found in rural areas. Future work – in the form of a longitudinal study – may extend this work and build on studies by Hatakka and Lagsten (2011) and Haenssgen and Proochista (2017) to investigate further whether and how extensive m-money adoption facilitates financial inclusion, economic development, and national welfare. In particular, we also need future studies that investigate alternative motives for m-money adoption and use that we did not uncover with our research approach.

Overall, we hope to have stimulated a debate amongst scholars and practitioners on the growing phenomenon of m-money in light of numerous economic challenges such as poverty and insufficient inclusion in emerging countries. Thereby, we are ambitious to promote a discourse on m-money services in emerging markets and encourage their adoption and use in developing countries.

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No potential conflict of interest was reported by the author(s).

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7 Summary, Discussion, and Recommendations

7.1 Summary of findings and discussion

Towards answering the overall research question

"How can the adoption and use of m-commerce services be improved in Rwanda?",

this research has sought to improve the understanding of the potential of m-commerce in developing countries, exemplified by Rwanda. It focuses on mobile finance integrating m-payment, m-banking, and m-money solutions (Duncombe & Boateng, 2009; Kazan et al., 2018). It complements the literature by providing insights into the most significant drivers/barriers of m-commerce adoption in emerging markets.

The main findings are summarised and discussed following the five sub-questions raised in the introduction:

RQ 1: How can m-payments be successful in Rwanda?

The findings from Article 1 titled *"Learning from the Mobile Payment Role Model: Lessons from Kenya for Neighboring Rwanda"* reveal three main steps: Firstly, Rwanda lacks an effective multi-party platform to coordinate between MNOs, private enterprises, payment processors, regulatory agencies, and government departments. Collaborative efforts among players can promote competition while avoiding a dominant player controlling the most valuable resources and exercising significant market power (Constantinides et al., 2018; Hedman & Henningsson, 2015; Miao & Jayakar, 2013). Secondly, Rwanda needs to include properly incentivised agents in the distribution network. Successful agent management requires keeping agents' operations growing and their profits high, as well as providing them with proper training (Babatope & Mushunje, 2020). As in previous studies, these findings suggest that an aggregator model, such as that used by M-Pesa in Kenya, may help Rwanda reach out to the otherwise disconnected population (Donovan, 2012). Thirdly, Rwanda ought to make maximum efforts to secure a sufficient power supply (Anthony & Mutalemwa, 2014), with the majority of villages in Rwanda yet to be connected to the national electricity grid.

RQ 2: How and to what extent can m-banking foster the performance of microfinance institutions?

Article 2 titled *"The Role of Mobile Banking in Fostering Microfinance Performance – A Case Study of Urwego Opportunity Bank in Rwanda"* finds that customers appreciate that m-banking saves their time (de Quidt et al., 2016) as they can pay at any time and from anywhere. The UOB case study confirms that m-banking simplifies administrative processes, thus reducing transaction costs and default rates (Ammar & Ahmed, 2016; Bjoerkegren & Grissen, 2020; Karlan et al., 2016; Kweyu & Ngare, 2014). It also confirms that not knowing m-banking service fees may hinder wider deployment (Ammar & Ahmed, 2016; Asongu, 2018; Baptista & Oliveira, 2015).

RQ 3.1: How can m-banking contribute to reducing transaction costs for MFIs in Rwanda?
RQ 3.2: How can m-banking contribute to reducing MFIs loan defaults in Rwanda?

Article 3 titled *"Mobile Banking Impacting the Performance of Microfinance Institutions: A Case Study from Rwanda"* also finds evidences that m-banking enables MFIs centralizing information about clients and loan portfolios as well as streamlining administrative processes (Bjoerkegren & Grissen, 2020; Karlan et al., 2016; Kweyu & Ngare, 2014). However, inefficient agent networks partially undercut the positive effect of m-banking on loan defaults and transaction costs (Dodson, 2014). Customers are more likely to do business with an MFI with a visible agent network and loan officers located near their homes (Abbink et al., 2006; Agarwal et al., 2017).

RQ 4: What are the barriers and consequences of rolling out m-payment services to tourism SMEs in Rwanda?

In Article 4 titled *"Mobile Payment Enhancing Tourism in Emerging Markets: A Qualitative Study among Small and Medium-Sized Enterprises (SMEs) in Rwanda's Tourism Sector"*, a multi-stakeholder analysis in Rwanda's tourism sector revealed that customer m-payment acceptance is heavily influenced by privacy concerns. This is consistent with findings in other sectors (Anthony & Mutalemwa, 2014; Kim, 2014). M-payment services that customers perceive to be secure and compliant with data privacy are more likely to be adopted (Kang, 2018; O'Reilly et al., 2012; Park et al., 2018). Familiarity with m-payments is important for wide adoption (Chogo & Sedoyeka, 2014). We do not find that tourism SMEs are restricted in their access to financing (Mwai, 2016; Nguyen, 2009). Instead, they generate modest returns on investment upon reaching

a critical mass of m-payment customers (Gao & Waechter, 2017; Mondego & Gide, 2018). At the country level, limited power availability lowers the acceptance of m-payment services among tourism SMEs (Oliveira et al., 2016).

In line with prior research, we found customers and companies benefit alike from increased convenience and time savings in comparison to paying cash (Bosire & Ntale, 2018; Omarini et al., 2018) which, in turn, accelerates the adoption of m-payment (Masocha & Dzomonda, 2018; Staykova & Damsgaard, 2015).

RQ 5: From a domestication theory perspective, how do farmers in rural Rwanda adopt and use m-money in their everyday life?

Along the four phases of domestication, appropriation, objectification, incorporation, and conversion (Haddon, 2011; Silverstone, 2007; Silverstone & Haddon, 1996), Article 5 titled *"Mobile Money Adoption in Rural Rwanda: A Domestication Perspective"* outlines the benefits of using m-money in rural areas.

At the appropriation phase, literacy and experience regarding m-money foster adoption. Unlike Silverstone (2007), Tengeh and Talom (2020), we found individuals' social ties to be more important to rural farmers than mass media. Family or friends who are familiar are vital for farmers contemplating adopting m-money and using the services. At the objectification phase, farmers complain about high costs associated with m-money transactions and demand for affordable electricity, and securing agents with adequate liquidity. At the incorporation phase, time saved and quick access to funds in the case of an emergency are key. Offering female farmers greater control over their financial lives also contributes to adoption (Mararo & Ngahu, 2017; Ngaruiya et al., 2014). Finally, at the conversion phase, the study indicates the importance of education and economic status. Murendo et al. (2015) produced a similar finding, stating that education and economic comfort correlate positively with m-money adoption.

7.2 Recommendations

Overall, this thesis suggests that practitioners and policymakers can contribute to economic growth in Rwanda by actively shaping the main inhibitors to a widespread adoption of m-commerce across a variety of sectors. The work sees the strongest action potential along four points:

- *Infrastructure use and development*. This research has identified several infrastructure issues, like power cuts or a lack of electricity in various areas and limited bandwidth or slow wireless network speeds. The government, mobile network providers, and other stakeholders must provide an accessible and affordable required infrastructure (Gbandi & Amissah, 2014; Iman, 2018; Tob-Ogu et al., 2018; Yunis et al., 2017). Internet service provision commitments would reduce bandwidth costs and make connections more affordable (Au & Kauffman, 2008; Dahlberg et al., 2015; de-Reuver et al., 2016). Renewable energy solutions, such as stand-alone systems and mini-grids, could limit electricity shortages and insure reliable and affordable access to electricity (Hedman & Henningsson, 2015; Loudon, 2016; Uwamariya & Loebbecke, 2019).
- *Effective regulatory framework*. A regulatory framework should foster scalable m-commerce services. Commercial regulations need to enhance collaboration among stakeholders and balance the profitability among participants (Olayinka et al., 2019; Rahman, 2013) while strengthening the privacy and security of users (Chau et al., 2020; Jumba & Wepukhulu, 2019; Loudon, 2016).
- *Education/Awareness*. Marketing campaigns via radio, television, posters should raise awareness of the benefits and ease of use of m-commerce (Saleh & Mashhour, 2014; Teo et al., 2015). In smart villages, rural communities should take the initiative to promote m-commerce.
- *Structure of the distribution network (agents).* Providers, such as MFIs, should add more agents to their networks (Dismas & Mutalemwa, 2014) and ensure cash solvency (Fisher, 2010). M-Pesa's aggregator model in Kenya has proven to be successful; it could serve as a role model for spreading m-commerce in Rwanda (Dismas & Mutalemwa, 2014; Uwamariya & Loebbecke, 2019).

8 Contribution, Limitations, and Suggestions for Future Research

8.1 Contribution to the literature

This research adds to a relatively small number of studies in the area of technology adoption involving multiple stakeholders and focusing on emerging economic countries such as Rwanda.

Its strength lies in the diversity of settings used to accumulate data from different sectors (Alfahl et al., 2012; Du & Li, 2019). It allows stakeholders in Rwanda (and similar market contexts) to tailor programs and interventions to drive m-commerce and m-adoption (Alfahl et al., 2012; Baker et al., 2019).

Further, the research offers several theoretical contributions to the field of technology adoption. Firstly, the TOE model (Tornatzky & Fleischer, 1990) has been successfully modified to include seven new m-payment-specific factors: interoperability, deployed technological standards, distribution network (agents), resources, financial infrastructure, collaboration among stakeholders, and (sufficient) electricity. The modified model contributes to the body of knowledge by providing a better predictive power for determining technology adoption, with the extended framework being replicable or extendable for different economies to determine whether the findings are similar or otherwise.

Secondly, this research contextualises TCE theory (Coase, 1937), adding the loan default dimension to analyse the impact of IT on microfinance. The inclusion of loan default allows explaining mobile service usage in more detail, making the model more comprehensive for explaining the role of m-banking in microfinance. Furthermore, this work complements and extends the academic literature on technology adoption in less digitalized economies (Mehmet & Arup, 2017). It highlights and reconfirms that m-banking is important for enhancing microfinance efficiency (Prause, 2019).

Thirdly, this research presents evidence on how tourism SMEs can effectively utilise m-payments as a commercial tool to reach more customers and satisfy customer needs. We demonstrate that tourism m-payment service providers face the challenge of developing and advertising tourism m-payment solutions to suit tourists. Another managerially interesting insight derives from the relevance of the perceived security of tourism m-payment services. Consequently, managers must focus on the long-term strategic aspects highlighted above to transform tourism m-payment services into a mass-market reality.

Fourthly, the research contributes to domestication theory (Silverstone & Haddon, 1996). To the best of our knowledge, it is the first application of domestication theory to m-money adoption among rural farmers. It integrates new contextual factors into each domestication dimension, thus

contributing to the literature on the domestication of mobile technologies. This research also underpins the importance of a socio-material perspective on rolling out the technology, considering people and technology as deeply intertwined (Orlikowski, 2007). Furthermore, the agricultural sector is revealed by this research as an important area for technology adoption research. To date, technology adoption research has largely focused on IT, manufacturing, retail industries and banking (Ammar & Ahmed, 2016; Apanasevic & Markendahl, 2018).

Finally, the work complements earlier studies on the expanding 'Fin-Tech' or digital financial services (Goldstein et al., 2019; Navaretti et al., 2017; Yermack, 2018). It promotes mobile financial services as instrumental to the integration of unbanked population segments into mainstream financial systems (Duncombe & Boateng, 2009; Storchi & Johnson, 2016).

8.2 Research limitations

This research has some limitations. Firstly, due to the *qualitative approach taken in all research endeavours*, it was neither possible to quantify the relative impact of the contextual factors examined (Glaeser & Laudel, 2019) nor to establish causality between the contextual factors and outcomes (Mohajan, 2018). Qualitative approaches like document analyses and face-to-face interviews may raise criticism from a positivist perspective (Chua, 1986).

Secondly, this research is *limited to mobile financial services*, a subset of m-commerce, and to *Rwanda*, a developing country with a collectivist culture. Rwandans are community-oriented people, as can be seen in their social customs and family life, with interpersonal relations being the pillar of community life (Grayson, 2017). Stakeholders from other countries may have different attitudes, perceptions, and reactions to m-commerce services (Flick, 2014; Flick, 2018).

Thirdly, during the interviews, most informants wished to remain anonymous, agreeing only to specify their occupations or activities. Consequently, interviewees are assigned titles, such as "interviewee A" and "expert A" to protect their anonymity (Saunders et al., 2016). Some participants hesitated to answer questions particularly related to the role of the government in technology adoption.

8.3 Suggestions for future research

There are several possibilities for future research. Future research may wish to replicate the extended model and frameworks for different operationalisations to add a technological view of adoption and related factors from other perspectives. It may also opt for a quantitative analysis investigating the relative impact of the different factors identified in this thesis. Or future work may want to shift the study focus. While this work analysed the factors promoting the deployment of m-commerce and mobile financial services, future research may want to analyse the impact of m-commerce adoption on financial inclusion, economic development, and national welfare. Finally, future studies may want to address the difference between the adoption of m-commerce services in urban and rural areas – an issue that gains importance throughout many developing countries.

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Peer-Reviewed Journal Publications

1. Uwamariya, M., Loebbecke, C., Cremer, S. (2021) Mobile money adoption in rural Rwanda: a domestication perspective, **Africa Journal of Management**, 7(2), 314–337.
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Statement

I hereby declare that I have completed the following work without help from third parties and without means of assistance, apart from those indicated. I have cited the sources of all direct and indirect q2uotations, dates, and ideas that are not my own. The following persons assisted me with the selection and evaluation of research materials as described below and for payment or without payment as indicated:

No other persons except those listed in the work's introduction were involved. I certify that I have not used the paid services of consultation firms, and that I have paid no one, directly or indirectly, for tasks connected to the contents of this dissertation. The work has not yet been submitted in the same or similar form to another institution in Germany or abroad. I certify that this statement is true and complete to the best of my knowledge.