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WORKING PAPER ON DIGITAL FINANCE

Working Paper on the Importance and Impact of Digital Technologies for Financial Inclusion in the East African Microfinance Sector

including empirical research on the
Digital Readiness of MFIs/SACCOs

Arbeitspapier zur Bedeutung und dem Einfluss digitaler Technologien auf die finanzielle Inklusion im ostafrikanischen Mikrofinanzsektor

einschließlich einer empirischen Untersuchung zur
Digital Readiness von MFIs/SACCOs

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ABSTRACT [ENG]

The impact of digitalisation on the economy and the financial sector is increasing, transforming the lives of many Africans. Improved infrastructure and mobile solutions have increased financial inclusion in Africa to an unparalleled extent; however, digitalisation in Africa lags compared to international progress. The German Sparkassenstiftung for International Cooperation (DSIK) supports the local microfinance sector in Eastern Africa with two regional projects that focus on vocational and commercial education, as well as rural development by institutionally strengthening the microfinance sector. These projects are funded by the German Federal Ministry of Economic Cooperation and Development (BMZ). The focus of the projects lies on the implementation and promotion of digital solutions to strengthen the sector and to increase access and knowledge. This working paper serves as a basis for guiding the digitalisation-related project activities and focuses on the characteristics and specifics of digitalisation in the African microfinance sector. The first part of the paper highlights the relevance of digitalisation, advantages and specific hurdles; provides a market and trend analysis; and examines sustainability in the context of digitalisation as well as the impact of digitalisation on the business models of Microfinance Institutions/Savings and Credit Cooperative (MFIs/SACCOs). The available studies are evaluated and discussed. The second part of the paper provides a summary of the digital surveys conducted through DSIK in Eastern Africa and highlights the level of digital readiness and the associated project implications.

ABSTRACT [GER]

Die Digitalisierung hat eine zunehmende Auswirkung auf die Wirtschaft, den Finanzbereich und das Privatleben vieler Afrikaner. Verbesserte Infrastrukturen und mobile Lösungen haben in einem unvergleichlichen Maße die finanzielle Inklusion in Afrika vorangetrieben, wenngleich der Fortschritt der Digitalisierung im internationalen Vergleich zurückliegt. Die Deutsche Sparkassenstiftung für internationale Kooperation (DSIK) unterstützt den lokalen Mikrofinanzsektor im östlichen Afrika mit zwei Regionalprojekten zu den Themen berufliche und kommerzielle Bildung sowie ländliche Entwicklung durch Stärkung des Mikrofinanzsektors, die vom Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (BMZ) gefördert werden. Ein wichtiger Schwerpunkt liegt hierbei bei der Einführung digitaler Lösung, um den Sektor für die Zukunft zu stärken, und den Zugang sowie das Wissen zu erweitern. Das vorliegende Arbeitspapier dient als Grundlage für die Ausrichtung der digitalisierungsbezogenen Projektaktivitäten und konzentriert sich auf die Merkmale und Spezifika der Digitalisierung im afrikanischen Mikrofinanzsektor. Im ersten Teil wird die Relevanz der Digitalisierung, Vorteile, spezifische Hürden, eine Markt- und Trendanalyse, Nachhaltigkeit im Kontext der Digitalisierung sowie die Auswirkungen auf die Business Modelle der MFIs/SACCOs beleuchtet und verfügbare Studien zu den Fragestellungen ausgewertet und vorgestellt. In einem zweiten Teil erfolgt die Zusammenfassung der im östlichen Afrika durchgeführten Digitalisierungsstudien zur Ableitung des digitalen Reifegrads sowie der damit verbundenen Projektimplikationen.

Table of Contents

List of Acronyms

ACCOSCA	African Confederation of Co-operative Savings and Credit Associations
AI	Artificial Intelligence
AMFIU	Association for Microfinance Institutions Uganda
AU	African Union
AWZ	Amazon Web Service
BMC	Business Model Canvas
CBS / CIS	Core Banking System/Credit Information Sharing System
CISS/CRB	Credit Information Sharing System, also called Credit Reference Bureau
CRM	Customer Relationship Management
DFS	Digital Financial Services
DMS	Document Management System
DSIK	Deutsche Sparkassenstiftung for International Cooperation
EA	Eastern Africa
EEE	Electric and Electronic Equipment
ERP	Enterprise Resource System
FSDT	Financial Sector Deepening Trust
GCI	Global Cybersecurity Index
GSMA	Groupe Speciale Mobile Association
Ibid.	ibidem
ICT	Information and Communication Technology
IoT	Internet of Things
IRCAI	International Research Centre on Artificial Intelligence
Kt	Korea Telecom
KYC	Know-Your-Customer
M&E	Monitoring and Evaluation
MFI	Microfinance Institution
MNO	Mobile Network Operator
MSME	Micro, Small, Medium Enterprises
MNO	Mobile Network Operators
POS	Point of Sales
RCA	Rwanda Cooperative Agency
RIM	Réseaux des Institutions de Microfinance
RP	Regional Project
SACCO	Savings and Credit Cooperative
SCCULT	Savings and Credit Co-Operative Union of Tanzania
SDG	Sustainable Development Goals
SLA	Service Level Agreement
UN	United Nations
U-SACCO	Umurenge SACCO
USSD	Unstructured Supplementary Service Data
WTO	World Trade Organization
w. Y.	without year

List of Figures

1 Introduction

Digitalisation is the buzzword of the information and communication era, a global trend and a critical element in the modern economy. Indeed, digitalisation, along with globalisation, is rapidly transforming Africa's technological ecosystem. Tech hubs have arisen all over the continent, with the largest in Ghana, Kenya, Nigeria and South Africa; these start-ups hubs are flourishing as they bridge, or at least narrow, the digital gap of the continent (Muriuki 2021).

Digitalisation could significantly advance Africa's development by leapfrogging development steps, narrowing the digital divide and reinforcing social and economic inequalities. Current trends in the mobile market, investments in digital infrastructure, affordable digital solutions and education have increased the demand for digital solutions and technical devices. However, research on the adaption of internet access and smartphone ownership has revealed that the adaptation in Africa is still inadequate by international standards but has been steadily increasing in recent years (Silver and Johnson 2018). This was accelerated during the COVID-19 pandemic, which highlighted the importance and advantages of digitalisation.

However, the digital transformation of Africa faces challenges that are unique from those in the Global North. Frequently, established technologies do not match the requirements of many African societies, particularly in terms of affordability, availability and the level of education.

The areas of knowledge and education, health services, digital finance, e-government and social participation are the most advanced in terms of digital transformation on the African continent (BMZ 2016).

Digital transformation affects both the economy and society. Thus, the financial sector is of great importance, as it underpins the economic sector and represents the interface between sectors. In Africa, 490 million people (36% of the population) currently live below the poverty line. With their financial situation, they do not belong to the customer groups on which commercial banks focus (Human 2021). Consequently, these portions of the population are excluded from the financial products and services, which prevents them from participating in areas of economic life and realising their full potential as part of the economic cycle. Thus, the microfinance sector plays a significant role in the financial inclusion of poor and marginalized populations. In Rwanda, for example, only 50% of the population had access to financial services in 2008. Therefore, the Rwandan government established Umurenge SACCOs (U-SACCOs) to increase physical access to financial services, and 89% of the population had access to these services in 2016, according to FinScope. The formal banking sector only covers about 26% of adults in Rwanda, while 42% are covered by U-SACCOs and only 21% are covered by the informal financial sector, which is characterised by private savings circles (DSIK 2019).

Digitalisation is also an important factor of modern finance in East Africa and plays an indispensable role in equipping MFIs/SACCOs for the future. The digitalisation of the financial sector has mainly originated from mobile network operators (MNOs), and numerous providers, including Safaricom, MTN and Airtel, have revolutionized payment behaviours and increased financial inclusion for the marginalized groups (ARKADIA and DSIK 2016). However, the focus of MNOs mainly lies on payment transactions, whereas access to other financial products and services, such as savings accounts and

loans, is also an important aspect of financial inclusion. Furthermore, the microfinance sector has a social mandate and is concerned with equitable access to financial services and promoting financial inclusion. In contrast, MNOs are mainly economic businesses pursuing economic interests that do not foster digital education through additional trainings, even though a social commitment cannot be denied (DSIK 2019).

About DSIK

The vision of German Sparkassenstiftung for International Cooperation (DSIK) is open access to financial services around the world, with a focus on financial inclusion of poorer and marginalised populations. DSIK has projects in over 50 countries, including Latin America, the Caribbean, Africa, Caucasus and Asia. International and local employees support these projects as consultants. This report focusses on the project activities in Eastern Africa, where two new projects were launched in 2019 in close collaboration with local partners (mainly apex organisations, academies, and universities, as well as ministries and regulatory authorities). The projects aim to end poverty (Sustainable Development Goal [SDG] 1) in the region by promoting financial inclusion and alleviating a lack of financial education and liquidity shortages. Both projects are conducted in Burundi, Kenya, Rwanda, Tanzania and Uganda, where they provide a thematic framework in which the individual countries determine activities according to needs and in cooperation with the partners. This results in project portfolios that differ in their characteristics in the respective countries. This approach is necessary as the microfinance sectors in the countries, including their legal governance and policies, differ. Furthermore, the individual level of development needs be considered as well, to be able to develop and establish solutions, which fit the needs of end-beneficiaries.

The first project focusses on commercial and vocational education in the context of microfinance (SDG 4—Quality Education). The aim of this project is to establish structures for a sustainable and valuable education, including increased knowledge and skills in managing MFIs and SACCOs as well as end-beneficiaries, who will benefit from increased financial resilience through better understanding and usage of financial products. The project promotes the sustainable establishment of training institutions and academies for MFIs/SACCOs, Micro, Small and Medium Enterprises (MSMEs) as well as entrepreneurs and aims to strengthen the professional qualifications of the supervisory bodies.

The second project focusses on rural development through institutional strengthening of the microfinance sector (SDG 8—Decent Work and Economic Growth). The aim is to support stable, sustainable, inclusive growth by professionalising apex organisations, microfinance institutions and academies so they can fulfil their social mandate. These institutions benefit from a broad range of services and products, including digital solutions like shared IT services for increased competitiveness and market penetration that support cost structures and meet new regulatory requirements. These activities have a direct impact on rural populations in the project countries, better equipping them with financial services and products.

About the Paper

Both the regional projects of DSIK in Eastern Africa have a strong focus on digitalisation. The first project offers digital education in the form of virtual business games, online training and gamification. The second regional project has a stronger focus on using digitalisation to strengthen microfinance institutions. The project portfolio comprises the implementation of core banking systems, (shared) digital solutions for interoperability between MFIs/SACCOs, credit reference bureaus, performance monitoring tools and possible digital aspects in product development. In both portfolios, digitalisation is a key concept for fostering financial inclusion, fulfilling the social mandate and supporting economic, ecological and social sustainability. The forced digital transformation in the microfinance sector is complex, and diverse aspects must be considered to ensure that the disruptive potential of digital technologies is used profitably and sustainably. Consequently, the project began with a preliminary phase to analyse the project condition and environment. In context of the official BMZ project proposal, one of the defined objectives focusses on the participation of the microfinance sector in digitalisation. Thus, this research paper includes primary and secondary research on the importance of digitalisation for the microfinance sector and its impact on business models of MFIs/SACCOs.

This working paper analyses the digital transformation of the African continent as well as its impact on digital finance in the general and microfinance sectors. The paper aims to understand the digital market, the state of digitalisation, technical possibilities and trends as well as the benefits and challenges of digital solutions in Africa based on desk research. A survey was conducted in each project country to analyse the different levels of digital readiness of the associated MFIs/SACCOs of our local partners to understand their needs and identify areas of intervention for future project activities. Some of the gaps identified are already well known (e.g., a lack of Core Banking Systems [CBS]); therefore, various project activities on digitalisation have already begun. Essential elements about regulations, governance, and policies are unique to each country and were thus analysed in the individual country reports.

Based on information from the desk research and the results of the digital survey, DSIK in Eastern Africa will implement a digital strategy for their project activities in the first project main phase, which began on 1 October 2021. This strategy established a pattern for future project activities and ensured a goal-oriented digital transformation in collaboration with our partners, as well as the greatest possible impact of project resources. The strategy will contain information about the positions, focus and objectives of DSIK in Eastern Africa in the field of digitalisation and how these goals can be achieved.

Part I – Secondary Research

The first section of the report summarises the results of intense desk research and market analyses over the last few months. It will build a knowledge base and provide an overview of the different terms, chances, challenges, trends and other important topics regarding digitalisation (e.g., sustainability and gender).

2 Relevance of Digitalisation

This section analyses the importance and impact of digitalisation on the global perspective and specifically covers the relevance of digitalisation from an African perspective.

2.1 Relevance and Driving Forces of Digitalisation: A Global Perspective

The term digitalisation is incomparably popular, incorporating nearly all sectors of the economy, political systems and social cultures. Digital transformation seems to be not only accelerating but also intensifying. In this section, the driving forces (Fig. 1) of digitalisation and its relevance are analysed.

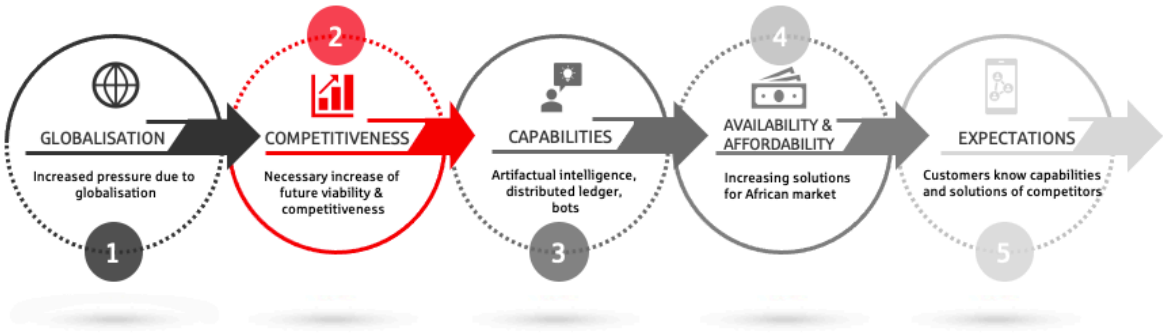

Figure 1: Driving forces of digitalisation
(Source: DSIK illustration)

The increasing interconnection of political, economic and social relationships, coupled with the new possibilities of information and communication technologies (ICT), is changing all political and economic spheres, as well as individual lives around the world (BMZ 2016). On an unprecedented scale, information is accessible around the world in real time, increasing the competitive pressure on businesses, politics and individuals (Bughin, Dhingra, Lund, Manyika, Stamenov and Woetzel 2016). Anyone who is able to use this information for their benefit in a quick and efficient way can gain a competitive advantage for their business interests. Thus, the survival of a company or even an economic sector may depend on how well digital solutions can be implemented and their advantages be used (Hagiu and Wright 2020). As a result, the competitive pressure on each player has increased. Politicians must create a framework for digitalisation while subjecting their ministries and services to a digital transformation, also called e-government (OECD 2019). Business enterprises are confronted with an increasing number of start-ups and smaller innovators that relentlessly expose the weaknesses of existing business models. Social cultures and individuals are not only confronted with

new requirements in work life but are also simultaneously confronted with the increasing digitalisation of private life through smartphones and the internet (Manyika et al. 2016).

Furthermore, new and innovative technologies with disruptive potential, such as artificial intelligence (AI), bots and distributed ledgers continue to arise. Although most of these technologies are still under development and have not reached market maturity, the first prototypes are in use, providing a glimpse of the digital world of tomorrow (Norton 2021). At first, technologies were only affordable (e.g., smartphones) and accessible (e.g., internet) to an elite group of the population, but they quickly became accessible for most parts of the population—at least in the Global North (Poushter 2016). This accessibility has allowed users to retrieve an excessive amount of information, the access to which shapes the expectation of political, economic and social participants in the framework of globalisation. This disruptive transformation cannot be avoided, as efficiency and cost effectiveness are necessary to compete in the market.

Further key drivers are climate responsibility and sustainability, demographic shifts, social well-being and work-life balance (ITU 2021). African countries are affected by these further key drivers more than others, as financial health and financial resilience are less pronounced. Political or economic crisis would be fatal, especially for the poorer and marginalized population, as fewer resources are available to soften the impact.

Impact of COVID-19

In the context of crises, the COVID-19 pandemic had a huge impact on digitalisation. The pandemic accelerated digital transformation, as lockdowns worldwide required digital employment and work models, as well as digital services and product deliveries. Digital communication and collaboration solutions were highly needed, and e-learning and digital entertainment solutions experienced high demand. Governments around the world relied on digital data regarding health status and the occurrence of infections to respond with appropriate measures to protect the economy and population. Although research data on the contribution of digitalisation toward mitigating the impact of the pandemic is limited, general emerging evidence shows that requests for digital services and technologies from businesses and consumers increased and accelerated during this time, creating digital development that is typically only experienced over several years (ITU 2021).

2.2 Relevance of Digitalisation for Economic Development and Financial Inclusion in Africa

Globalisation and digitalisation are megatrends that affect the African continent no less than any other areas of the world. Digitalisation has the potential to eliminate inequalities and injustice while creating knowledge and value for the economy and broader population, shaping fair globalisation simultaneously (BMZ 2016). Its capability to leapfrog development steps is undeniable. For example, broad portions of the population use mobile payments for transactions even when traditional bank accounts are inaccessible. While landlines for internet and telephone are still missing in some areas, mobile communication systems and cell towers enable phone calls and even mobile internet connection. For prospective leapfrogging, further preconditions must be complied with, including large-scale investments for improved infrastructure, a suitable regulatory environment and innovative business models for economic businesses. Furthermore, a focus on research and

development of technologies, when geared towards wealth creation, strengthens Africa's value chains and innovation capacity, as well as Africa's position in the global scientific community. (Diop 2017).

Digitalisation modernises and innovates collaboration in cooperative development and has become an integral part of development. Digital solutions in Africa are implemented faster than in the Global North—mobile payment systems not less than five times faster. For example, the number of internet users tripled between 2010 and 2016 (BMZ 2016).

While all the above-mentioned driving forces of digitalisation apply in the African continent, the characteristics are different. Information and data are not yet available or are highly limited, and resources for data analysis not yet elaborate (ITU 2021). However, the competitiveness is similar, as new technologies enable unprecedented opportunities for socio-economic development. Digitalisation in Africa can be seen in areas of digital finance, e-government, knowledge and education, e-health services and, partly, social and political participation. The BMZ (2016) estimated that productivity could be increased by 25% and 140 million jobs could be created if the internet was accessible and utilised to the same extent as in the Global North. In the financial sector, most innovations are generated by the mobile market or fintech's and are based on a mixture of old and new technologies. These innovations allow different parts of the population to be reached and thus accelerate financial inclusion (ARKADIA and DSIK 2016).

Impact of COVID-19

The COVID-19 pandemic disrupted the life and the economy of African countries deeply. The UN stated that disruptions of this depth would have been impossible in a normal environment (UN w. Y.). Research data about the impact of COVID-19 and the effects of digitalisation in Africa are limited, but evidence has shown the positive effects and accelerated digital development on the continent (ITU 2021). A report of World Banks Africa's Pulse stated that 25% of businesses in the sub-Saharan region increased their investment in and promoted the use of digital solutions (World Bank 2020).

The pandemic highlighted the urgency and critical need for universal digital access. Digital solutions were in the forefront of the pandemic response, through their used to trace the virus and infection rate and monitor economic health during the lock-down. However, the demand for digital technologies eluded most African countries, as the digital divide excludes large portions of the population from digital services (United Nations w. Y.).

Jayaram, Leiby, Leke, Ooko-Ombaka and Sun (2020) from McKinsey and Company predicted that the pandemic would begin "[…] a large-scale reimagination of Africa's economic structure, service delivery systems and social contract. The crisis is accelerating trends such as digitization, market consolidation and regional cooperation, and is creating important new opportunities—for example, the boost local manufacturing, formalize small businesses, and the upgrade urban infrastructure". Furthermore, a study by the European Investment Bank (2020) found a high demand for the following digital solutions:

- collaborative tools,
- communication tools,
- contact-tracing applications,

- health care and e-Health tools (e.g., self-assessment tools),
- drones and robots,
- educational technologies and
- digital payments.

Furthermore, the claims about stressed mobile and fixed network connections increased demand for connection in the home office, online education and entertainment (ITU 2021).

Digital transformation in Africa is unique, but its economic, political and personal effects, as well as the benefits and opportunities for the African continent, are undoubtable. However, the digital transformation in the Global North is moving forward rapidly, leaving the African continent behind and creating an even greater divide between the Global North and the Global South that could entrench inequalities (BMZ 2016). The main reasons, specific benefits and hurdles for digitalisation will be analysed in detail in section three, → Digitalisation in Africa.

2.3 Smart Africa Alliance

The relevance of digitalisation in Africa has been shown by the SMART Africa Alliance, an initiative that has grown from seven to 30 African countries. It is a joint "commitment from African Heads of State and Government to accelerate sustainable socio-economic development on the continent, ushering Africa into a knowledge economy through affordable access to Broadband and usage of Information and Communications Technologies" (SMART Africa w. Y.). A manifesto was signed by the seven original initiators in January 2014 and is the base for the ICT agenda on the African continent.

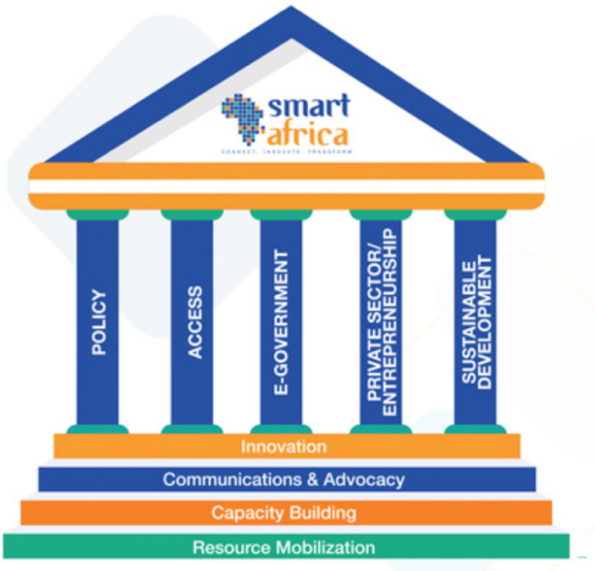

Figure 2: Smart Africa framework
(Source: https://smartafrica.org)

As shown in Figure 2, the framework contains five pillars and four enablers.

The *five pillars*, also known as the five principles of SMART Africa, are as follows:

- Policy,
- Access,

- E-Governance,
- Private Sector/Entrepreneurship and
- Sustainable Development.

The four enablers of ICT are as follows:

- Innovation,
- Communication and Advocacy,
- Capacity Building and
- Resource Mobilization.

With the Manifesto, the signatory African countries agree that ICT should be central to their national political and economic agendas, in aim of promoting socio-economic development (policy) and improve access to ICT, more specifically, broadband (access). Accountability, efficiency and openness shall be improved through ICT (e-governance) while prioritising the private sector and innovations from start-ups and entrepreneurs (private sector/entrepreneurs). This prioritisation includes sponsorship and mentoring, as well as capacity-building programmes and intellectual property protection. Thus, ICT will leverage sustainable development of economies and other social aspects (Nkurikiyimfura 2015).

The mentioned objectives of the Smart Africa Alliance shall be achieved by harmonized policy, legal and regulatory frameworks. Beneficial market conditions shall increase the demand for ICT and attract new and large-scale investments in fibre optics, broadband, satellite, data centres, IoT, cyber security, smart cities, big data analysis and e-applications. This will increase the establishment of new markets and industries in the African continent, thereby creating sustainable and safe jobs (Nkurikiyimfura 2015).

The SMART Africa framework is completed by a network of partnerships with important actors from political and private sectors, including the African Union (AU), Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (BMZ), Groupe Speciale Mobile Association (GSMA), International Telecommunication Union (ITU), United Nations (UN) and World Bank (SMART Africa w. Y.).

3 Digitalisation in Africa

This chapter focusses on the most important aspects of digitalisation in the African continent. It highlights the general → Definitions, → Benefits, as well as → Challenges and Risks. The second half of this chapter outlines → Digital Trends in Africa, → Important Technologies for Digital finance in Eastern Africa and → Digital Sustainability.

3.1 Definitions

Terms like “digitisation”, “digitalisation” and “digital transformation” are often used synonymously by digital experts and have become modern buzzwords in marketing. These terms differentiate various strategies, making a deep understanding of these terms necessary (Walter 2021).

Digitisation
Digitisation describes the shift from analogue data or processes to digital ones and is also known as digital enablement. Processes or data do not change; instead, it is a one-to-one translation of physical information into digital information (Komor w. Y.).

Digitalisation
The term digitalisation means, that based on digital data, individual processes and institutional operations are established using digital technologies to transform the landscape of a business (Walter 2021). New business revenue and value-creating streams are accessed and developed (Komor w. Y.).

Digital Transformation
Digital transformation describes an entire digital framework in which different digital components merge into a bigger picture. Data are processed, systems are strategically added, and a digital landscape is developed. This goes hand in hand with comprehensive changes in business strategies and models (Yokogawa 2021).

Beyond the discussed terms, further and more specific terms in the context of financial inclusion and digitalisation require clarification.

Digital Finance
The European commission defines digital finance as a “term used to describe the impact of new technologies on the financial services industry. It includes a variety of products, applications, processes and business models that have transformed the traditional way of providing banking and financial services” (European Commission w. Y. a).

Digital Inclusion
Financial inclusion describes individuals’ and businesses’ access to affordable financial services and products, and digital inclusion is closely related with this definition (World Bank w.Y. b). Digital inclusion describes access to affordable information and communication technologies (ICT). It often focuses on marginalized groups, such as the poor portions of populations or people with disabilities, who are socially excluded (European Commission w. Y. b).

Digital Financial Services (DFS)

Digital financial services focus on the product or financial service delivered to customers through a variety of possible digital channels. These products and services include all types of payments, savings, loans and insurances. Digital channels are all possible access solutions via the internet (e.g., mobile banking, online banking, digitally connected ATMs, POS terminals and biometric solutions) (Afi-Global w. Y.).

3.2 Digital Divide and Digital Readiness

Digital Divide

The term "digital divide" was introduced in the late 1990s to describe the inequality of technological adaption. The concept is binary; it mainly divides between "haves" and "have nots" (OECD 2019). The term "digital gap" is also used to express these inequalities. More recently, concepts like digital readiness are asserted more often, allowing for a more detailed perspective on the digital divide and related challenges of technological adaption. The digital divide is particularly huge in the African continent compared to other parts of the world, affecting the vulnerable, marginalised and other disadvantaged individuals and groups in Africa (BMZ 2016).

Digital Readiness

The term "digital readiness" is used to describe the preparedness or maturity of organisations and individuals to adapt and use digital solutions. No general definition of the aspects and perspectives by which digital readiness can be measured exists. Generally, digital readiness is assumed to include (1) digital skills, which are necessary to use digital solutions of every kind, and (2) trust in digital solutions, which refers to trustworthiness in handling information or data as well as reliability (Horrigan 2016). The concept of digital readiness is a loose framework by which organisations and institutions develop their own concept and views on digital readiness. A few concepts are highlighted below.

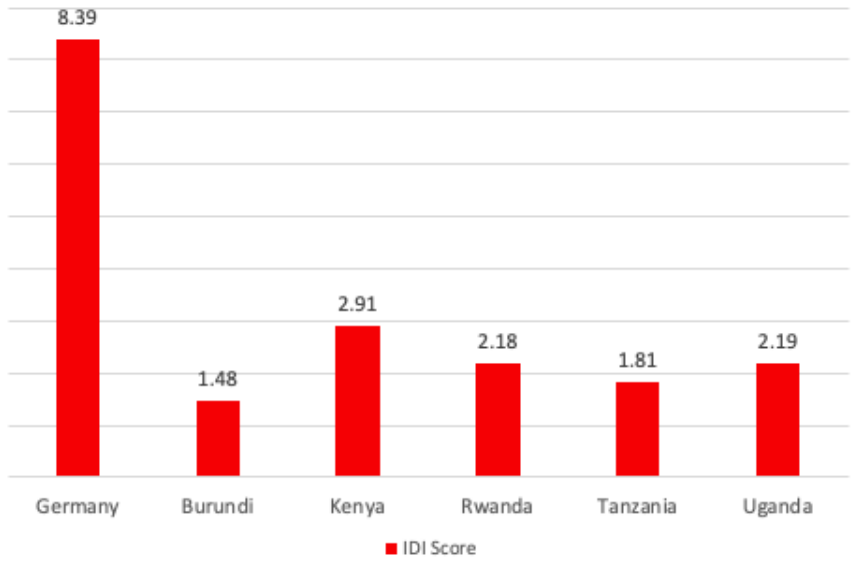

Figure 3: IDI scores Eastern Africa
(Source: DSIK illustration based on ICT Development Index [IDI] by ITU 2017)

According to the UNITU ICT Development Index (IDI), which is based on internationally agreed-upon ICT indicators and scaled from one to 10, the digital readiness of the population in Eastern Africa is restricted. Kenya ranks 138 with an IDI score of 2.91, which is far behind countries at the top of the list, such as Germany (exemplary for Europe in Fig. 3), which ranks 12 with a score of 8.39. Uganda ranks 152 with a score of 2.19, Rwanda ranks 153 with an IDI score of 2.18, and Tanzania ranks 165 with a score of 1.81. Burundi ranks the lowest at 172 with an IDI score of 1.48. In an international comparison of 176 countries, all mentioned East African countries are in the last quarter, with Burundi being among the last five (ITU 2017).

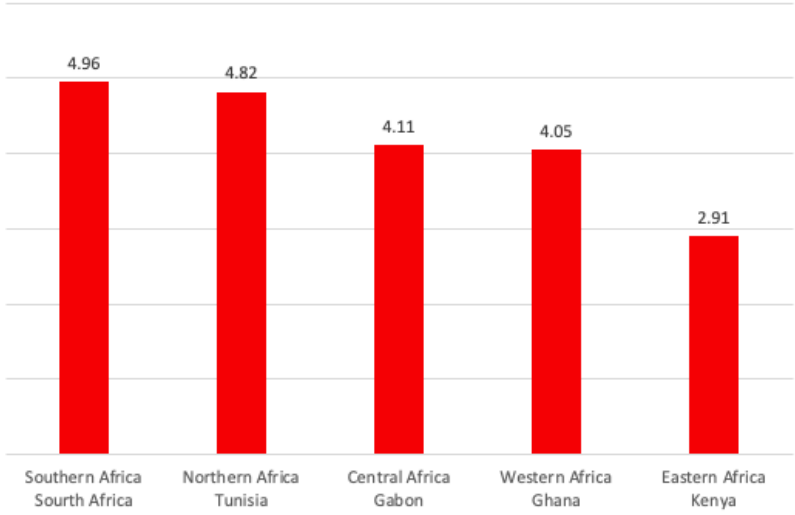

Figure 4: IDI scores of record leaders per region
(Source: DSIK illustration based on ICT Development Index [IDI] by ITU 2017)

In a continental comparison of record leaders, Kenya holds the record for Eastern Africa, ranking 138 with a score of 2.91. This is far behind the other regions. Representing Southern African, South Africa ranks 92 with an IDI score of 4.96, followed by Tunisia, which holds the record for Northern African, ranking 99 with a score of 4.82. Gabon holds the record in Central Africa ranking 114 with a score of 4.11, and Ghana holds the record in Western Africa, ranking 116 with a score of 4.05. While the records of Southern and Northern Africa are relatively close in score and rank, and those of Central and Western Africa are relatively close in score and rank, Kenya (Eastern Africa) is lacking in comparison. This emphasises the lack of digital readiness, which strongly influenced the project work of DSIK in Eastern Africa.

Pew Research Center

The Pew Research Center measures the digital readiness of businesses and individuals based on two aspects: digital skills and trust. Questions in their survey inquire about individuals' confidence in using a technical device, such as computers or smartphones. They also use statements to obtain information about people's identification, such as "When I get a new electronic device, I usually need someone else to set it up […]". The answers are given on a scale from "very confident" to "not confident at all" (ITU 2017).

Federal Ministry of Economic Cooperation and Development

The Federal Ministry of Economic Cooperation and Development (BMZ) proposed a multidimensional approach to determine digital readiness, including the individual ("The target group regularly uses

digital applications and systems"), organisational ("Within the organisation, there is sufficient and appropriate access to IT infrastructure") and social levels ("Relevant government institutions, NGOs and civil society organisations are in place for digitalisation"). The answers of participants of BMZ's digital readiness survey were scored on a scale from 0 (completely false) to 5 (completely true) (BMZ 2016).

Fostec and Company
Other frameworks focus on business only. The provider Fostec and Company has a digital readiness framework with over 130 questions, divided into five categories: strategy, customers, competitors, organisation and technology. Answers are scored on a 10-step scale from 1 as the worst to 10 as the best possible assessment (Fost w. Y.).

All concepts have their benefits and weaknesses. For practical application of digital readiness concepts, the focus behind the framework must be understood. For the projects of DSIK in Eastern Africa, the concepts are not specific enough. Therefore, the DSIK in Eastern Africa must implement their own framework to measure digital readiness in the upcoming surveys.

3.3 Benefits

The benefits of implementing digital financial solutions in Africa are numerous and have been highlighted from a macro perspective in the section → Relevance of Digitalisation. The beneficial aspects include leapfrogging development steps, closing the digital divide, economic development, inclusive growth through development of new business models, technical possibilities and skilled human capital. Further hope lies in fighting poverty and inequalities as well as promoting financial inclusion, specifically in the microfinance sector (Ndung'u & Signé 2020).

This section focusses on benefits of digital solutions from a meso perspective, as well as the specific benefits of digitalisation for microfinance institutions. DSIK in Eastern Africa identified six main benefits of digital solutions at the institutional level, regardless of whether the organisation is an apex organisation, MFI/SACCO or an academy. These benefits are as follows:

- Reaching a wider target group,
- Expanding product and service range,
- Experiencing the advantages of data analysis,
- Increasing transparency and security,
- Improving efficiency and automation, and
- Achieving cost benefits.

Reaching a Wider Target Group
The implementation of technical solutions allows different institutions to reach a wider target group. This is particularly of interest to MFIs/SACCOs, academies and broader parts of the population. Apex organisations, such as associations, can support MFIs and SACCOs remotely and offer them a broader range of services. This might attract new institutions not already onboard, creating a win-win situation between the institutions who benefit from associations while growing the power of these associations.

MFIs/SACCOs can expand their customer base particularly in remote areas. As many MFIs/SACCOs are not yet digitalised, the interoperability between different MFIs/SACCOs has not often been established. Therefore, payment transactions between districts cannot be made. Instead, money that needs to be transferred is given to a trusted driver, who transports it throughout the country. This lack of interoperability is a major problem for business owners. Thus, the best performing MSMEs seek financial services from commercial banks as soon their income is attractive enough for those banks. For MFIs/SACCOs this means, they will lose their most valuable customers.

Furthermore, digital training and digital bookings enable academies to reach a wider target group. For example, potential training participants might not have heard of training offers without digital marketing or a digital booking system.

For the population, digitalisation of financial services or financial education means that high-quality education and financial services can be delivered in remote areas. Some solutions (→ USSD) do not require internet access or a smartphone and are independent of time and location, thus yielding solutions for associations and MFIs/SACCOs as well.

Expansion of Product and Services Range
For associations, digital transformation allows expanded service offers, such as shared IT services for their members. These offers will create access to new revenue streams and strengthen the future of the organisation.

MFIs/SACCOs can also expand their product and service range, especially their payment transactions. Information about products can be spread easily, and payment flows can be digitally monitored. This includes loan pay-outs or repayments, as well as fees and general transactions.
Particularly for new customers, e-commerce is a challenge, as use and ownership of national IDs and local solutions for security and identity check are not yet comprehensively established. Thus, product or service purchase will stay on-site on a medium-term basis. The only expectation for digital transformation is interoperability with mobile money operators that offer comparable products (→ Mobile Market).

Digitalisation in academies will allow the implementation of different educational approaches, such as online and offline e-learning solutions, as well as partial adaption of digital solutions in on-site or physical trainings. The degree of digital implementation and its impact on the educational programmes can be adapted individually according to the needs of the academies.

Advantages of Data Analysis
Data foster the understanding and expectations of customers, members and participants (→ Big Data). If a general data base is not yet available for certain fields of interest for associations, MFIs/SACCOs or academies, these data can be collected using digital solutions. The advantages and opportunities of data analysis for these institutions are numerous. For example, digital payment flows can be analysed regarding the usage, customer behaviour or challenges. For academies, learning patterns can be analysed, as well as customer interests and behaviour when booking training offers. From a long-term perspective, data and data analysis reduce the institutions' risk, as well as that of the customers, as more information about the business, products, trainings and

customer interests become available. Additionally, know your customer (KYC) has an immediate impact on the revenue and profit gained by organisations.

Transparency and Security
Vulnerable data and digital information can be protected following international security standards (→ Security). Changelogs, application protocols and records of payment flows allow transparency regarding payment transactions and when and who authorises them. This results in reduced fraud and money laundering, as hiding the origin or whereabouts of money is more difficult.
An important aspect of security in banking is education and knowledge about correct handling solutions from users' perspective. Information about banking logins is highly sensitive and potentially interesting for parties who benefit from such information. Therefore, the protection of the login information on the user-side is as important as the protection of the technical solution itself. If login data are public, the best IT and information security within a system cannot avoid fraud.
The price and details of products and services, whether financial products/services or training, are more transparent for the end-user, and the comparison between different product/service providers and the value offered for a particular price are easier to access. This provides advantage for both sides: users spend money where they gain the greatest possible value, while organisations can maximise revenues.

Efficiency and Automation
Digital data are transferred within seconds around the world. For apex organisations, digital solutions enable them to support their members in real time. MFIs/SACCOs can ensure payment transfers and other financial services are done in in real time. Academies can handle more students and trainings, as they are not limited to facilities. Training material does not need to be printed out, thus saving time and resources.
Efficiencies increase when processes are automated. Chat bots can answer simple finance requests 24/7 without the need for human-to-human interaction. Missing credit repayments may result in blocking further withdrawals or automated alerts. Potential threats can be identified and avoided in real time without human interaction. These are just a few examples of possibilities that enhance efficiency through digital solutions and automation, and the number of possibilities is endless.

Cost Benefits
Digitalisation leads to large investments in IT infrastructure, hardware and applications. While initial investments are cost intensive, cost benefits will be achieved over the long term. Newly accessed revenue streams and changed business processes will shift the cost structure distinctly. Additionally, digital concepts, such as cloud computing and shared IT services, reduce the costs of IT investments and foster a focus on core business.

3.4 Challenges and Risks

The introduction already addressed the unique hurdles and challenges of digitalisation in Africa. Issues such as the digital divide and minimal digital readiness result from this unique set of challenges.

"The Four A's of Challenges" (Fig. 5) were first introduced to the author in the context of e-learning, but they can be transferred to every field of technological innovation in Eastern Africa (OER Africa 2019). The framework was used by DSIK in Eastern Africa to describe the unique challenges of digitalisation in their project work.

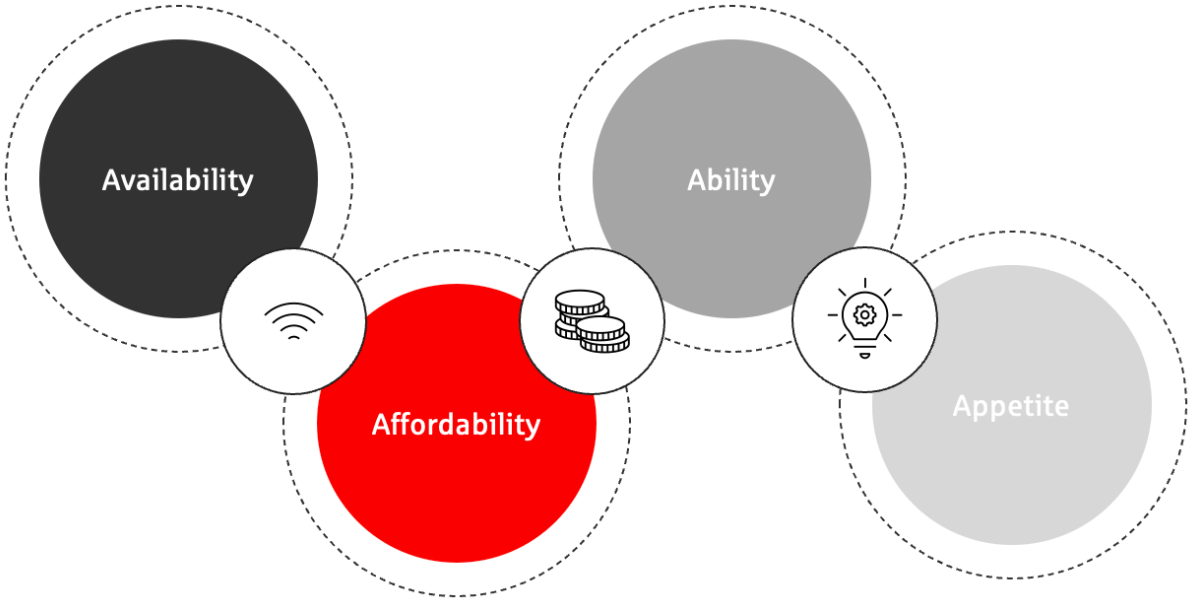

Figure 5: The four A's of challenges
(Source: DSIK illustration)

Availability
Most established technology is designed for the Western market. Thus, solutions suitable for the African markets, with the specific required characteristics and requirements, are lacking. Furthermore, a lack of infrastructure in terms of reliable electricity, which digital solutions are dependent; back-up solutions, such as renewable energy or generators; and internet connection, especially in remote areas, makes the issue even more complex. Little hardware is made in Africa, leading to a high dependency on imports from the Global North. Consequently, some goods are not available in some countries, or available options are limited to only a small range. Tech hubs all over the continent improve the situation in terms of software availability and development, but they lack technological possibilities or investments.

Affordability
Even if technical components, solutions and infrastructure, such as the internet and suitable applications, are available, they are not often affordable. Therefore, economies and society rely on third-party funding, which is limited and increases dependency on donors. For poor and marginalised parts of the population, digital solutions like smartphones, laptops and internet bundles are not affordable.

Ability
The aspect of ability focusses on education and knowledge in the context of digitalisation; this is also called e-Literacy. Even if solutions are available and affordable for the population, knowledge and experience on how to use the technology properly and experience its benefits are lacking. Additional trainings and education campaigns on low literacy levels are necessary to increase e-Literacy. A set of

different educational channels, such as radio or TV, on-site trainings and manuals, are necessary to ensure everyone can be digitally included. Lack of education may also lead to incorrect handling of technology, which may result in severe consequences. One example is the privacy of mobile money login data. The transfer or publishing of such data can lead to fraud and theft of personal financial resources.

Appetite

Related to the knowledge on how to use digital solutions is the appetite for it. A lack of experience and knowledge about the technological benefits leads to a lower demand and usage of digital solutions by the user. Misinformation or bad experiences (e.g., fraud) may lead to mistrust and reservations. Lack of understanding and knowledge regarding technology and its usage can even cause anxiety. Additionally, the lack of content also leads to a low demand for digital solutions. The result is a cycle within the digital divide: a lack of knowledge leads to low demand for digital solutions, but without digital solutions, reaching individuals and offering information are difficult.

Overcoming these challenges would foster digital inclusion and narrow the digital divide tremendously, which would also impact financial inclusion, as digital solutions have become the new standard in microfinance sector. Overcoming these challenges should not be misunderstood as a way of overcoming risks. Risks might be reduced through higher education and understanding technology, but risks with high impact will remain as operational risks and will require active monitoring. For associations, MFIs/SACCOs and academies operating in the microfinance sector, the following risks were identified by DSIK in Eastern Africa:

- Failed investments,
- Inefficiencies,
- Underestimated complexity,
- Security issues, and
- Sustainability.

Failed Investments

Implementation of digital solutions requires major investments to establish IT infrastructure and training. Even the best preparation cannot guarantee success; too many factors that determine the success of a digitalisation project are intertwined. An important factor is the correct implementation and setup of the technology. At this point, unforeseen factors can arise that complicate the implementation (e.g., loss of a project partner, new or overlooked requirements). Even if the actual project is successfully implemented, success is not guaranteed. This can happen, for example, if the solution does not fit the topic or business model or if the implementation takes too long and the requirements of the market change. With good preparation and the selection of the correct implementation partner, as well as active risk monitoring, this risk can be significantly reduced. Furthermore, a digital solution should never stand alone, as digitalisation needs to be seen in a bigger context, considering all linkages to equivalent topics.

Inefficiencies

Several factors can cause inefficiencies. Most often, inefficiencies are caused by poor implementation, issues at interfaces or poorly coordinated processes, with a mix of physical and

digital components. Outdated IT landscape or incorrect operation can be another reason for inefficiencies.

Underestimated Complexity
Digital solutions require skilled administrators and users for efficient use. The growing number of different digital solutions creates a more complex IT landscape in companies. These landscapes are a living construct that must be updated and developed on an ongoing basis. At a certain level, a professional IT staff is necessary to manage the complexity of the IT landscape. Another solution is to focus on → Cloud Computing and shared IT services to "outsource" this IT responsibility and focus on the core business.

Security
Security is an important aspect for ensuring a secure IT landscape, and internationally accredited standards help assure a safe operation. These standards require an advanced understanding of information and IT security. The more complex an IT landscape, the more likely leaks can be overlooked, or issues can arise due to complexity. Solutions for this risk include qualified IT staff or the use of → Cloud Computing and shared IT services.

Sustainability
Digital transformation is expensive and is associated with major investments. Since cost benefits arise only after a period of time, sustainability and reliability of the implemented solutions are important aspects for success. Maintenance costs and renewals of outdated technology must be considered by businesses, and adequate training must be conducted to ensure the technology is properly and regularly used and achieves the desired benefits. This risk can be countered through good planning and preparatory work as well as close monitoring of the user at the beginning of the intervention. Additionally, updates must be conducted regularly to prevent obsolescence, which would lead to a bow wave of necessary innovations to reach efficiency again.

3.5 Digital Trends in Africa

The following section focusses on the superior digital trends in Africa influencing the financial sector. The following list of digital concepts and solutions are trending and do not claim completeness. Furthermore, the list only contains trends applicable to the projects of DSIK in Eastern Africa:

- Artificial Intelligence (AI)
- Big Data
- Cloud Computing
- e-Learning and m-Learning
- Internet of Things (IoT)
- Mobile Market
- Security

Artificial Intelligence (AI)

Artificial intelligence (AI) is “the theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages” (Oxford Dictionary w. Y.).

AI is seen as a promising solution to overcome inequalities and poverty in Africa. However, its full potential has not yet been exploited due to the hurdle of capacity building for the usage of this technology. This capacity focusses on diversity in the meaning of the integration and consideration of people from varied socio-economic, cultural backgrounds and different genders. This has effect on the development of data sets and AI systems. The International Research Centre on Artificial Intelligence (IRCAI) identified three stakeholders for AI: higher education institutions, government and AI communities. This requires further research to gain deeper insights since the data are not currently available (Baijnath, Butcher and Associates 2021).

Possible use of AI in microfinance includes implementation of a voice assistant for voice banking, which would allow people with low literacy levels or disabilities to participate in banking. The estimated market size worldwide was about $5.21 billion in 2021—providing immense potential for further market penetration. Systems that are suits for the African markets do exist; the most well-known are Amazon’s Alexa, Apple’s Siri, Google Assistant and Microsoft’s Cortana. These were all created by American companies with a focus on a broader market, and they face several hurdles in the African market. First, most parts of the population do not have internet access, and IT infrastructure is unavailable. Second, AI software have difficulties understanding different accents and do not speak African languages. This is mainly due to a lack of data necessary for machine learning and the large number of languages spoken on the continent. The portions of the population who would benefit from these solutions the most are expected to be those with lower literacy levels, who often speak local languages. These challenges are just a few faced by AI (Mboua 2021). Thus, other solutions are more promising and would better fit the African market. For example, a start-up from Bangladesh created a voice assistant based on AI and an ERP system that is accessible through unstructured supplementary service data (USSD) to support the financial transactions of the illiterate population (Hishab w. Y.).

Big Data

Big data analysis describes an advanced technology used to analyse large amounts of data, which is characterised by its large size, diversity (which is potentially from different sources such as IoT, social media and mobile devices), different levels of structure (highly structured, semi-structures, unstructured) and different forms and types. The data sets are too large and complex to be analysed by traditional relational databases and need more innovative analytical approaches that utilise AI (IBM w. Y. a). Big data analysis is critical for competitiveness, as it supports know-your-customer (KYC), tailored service and product experience as well as marketing campaigns. If well applied, it creates new revenue streams and improves operations (Bothelho 2021). Data and information are another megatrend that will continue to be significant in the future. Whoever understands their customers best and can meet the customers’ demands in the most quick and tailored way will excel over competitors.

In Africa, the amount of data is limited but growing steadily due to the increasing usage of smartphones and online applications. Thus, analysing data quickly and efficiently to learn from commercial insights and meet customer expectations on time is a new paradigm on the continent. Frist and Sullivan forecasted a big data analysis market growth in the Middle East and Africa of 28% each year until 2025. Data will play such an important role in the future that large tech companies from the US will position themselves on the continent, collecting uncountable amounts of data. Target groups for big data analysis are diverse, from MSMEs to bigger enterprises, governments and non-profit organisations (Toesland 2021).

However, the benefits for African economies and the population are still limited due to complex hurdles, such as the lack of data scientists and IT professionals able to handle large amounts of data and big data analysis. Furthermore, students interested in these fields face a lack of highly qualitative educational trainings. The countries in Africa leading educational training in IT and AI are Kenya, Nigeria, and South Africa; this is a comparatively low number considering the large population and number of countries in Africa. Highly skilled IT experts are needed not only to avoid being left behind but also to create internal added value chains on the continent and to educate leaders who can make appropriate decisions based on the information. The research company Gartner estimated that 85% of projects dealing with the implementation of AI and big data fail to reach their desired impact. Thus, collaborations with established international institutions and companies are recommended (Toesland 2021).

Blockchain

Until the invention of blockchain technologies, also called distributed ledgers, all payments and transactions were processed through the ledgers of traditional banks in official currencies controlled by central banks. For this centralised payment system, every bank needs a banking license from the national central bank and must thus have an exceptional position (Fintropolis 2020). This changed with the publication of a white paper for a crypto currency called Bitcoin under the pseudonym Satoshi Nakamoto in 2008. The price of Bitcoin is highly volatile due the lack of real values in the background, which traditional currencies have due to the credibility of a country, its economic power, and the reputation and stability of its political system. Other factors are trade speculations and lack of regulation, which together make Bitcoin a speculative investment (Spilka 2021).

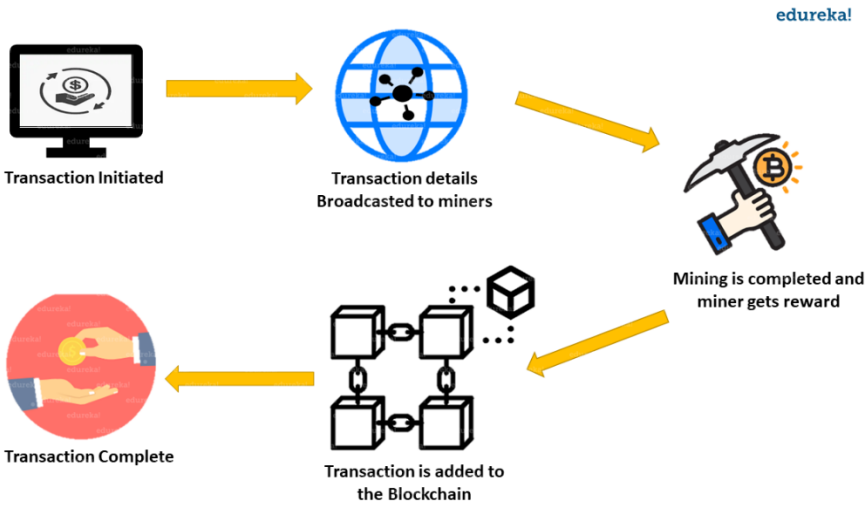

Figure 6: Blockchain technology
(Source: Laptrinhx 2019)

Brühl (2017) described various factors that make Bitcoin disruptive and revolutionary. For example, the blockchain technology behind the crypto currency allows distributed ledgers. Instead of a centralized bank ledger, the ledger is decentralized and unforgeable on the computer of each participating party. Chronological data blocks are "mined" every 10 minutes and connected with a reference (chain) and then locally saved on each device of the blockchain network. The result is an intelligent network of pre-existing technological components that enable payments without centralized bank ledgers. The first version of blockchain and the following versions are not yet fully stable and require many resources for the mining process, but the future of the technology is promising (IBM w. Y. b).

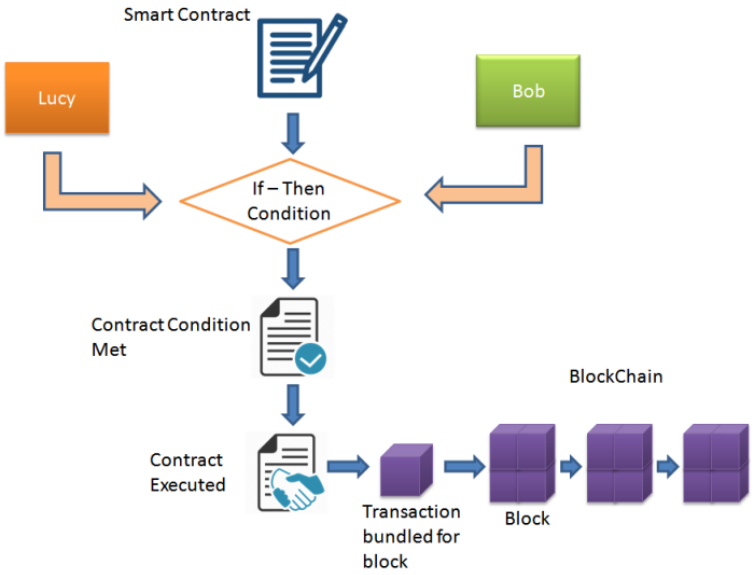

Figure 7: Blockchain 2.0
(Source: Modhe 2020)

Blockchain 2.0 enables smart contracts, which are supervised intelligently and will fulfil their conditions automatically when certain predefined milestones are reached (Fig. 7). Blockchain 2.0 is also related to the crypto currency Etherum and already used in the context of development

cooperation by the World Food Programme, which uses it as payment and identification system in a refugee camp in Jordan (von Haller Grønbæk 2016, Juskalian 2018). Other potential areas of application are e-identity and e-signature, microcredits and new payment solutions (Ganne 2018).

The next generation, Blockchain 3.0, with further development is already in progress. It will enable e-voting, e-licenses, e-health, e-company (simplified start-up processes), e-KYC, e-data (personal documents administrated with e-ID) and various other areas of application (Dalheimer, Fridgen, Fritz, Guggenberger, Hoeren, Holly, Kreutzer, Leiner, Nouak, Otto, Prinz, Rose, Schulte, Schütte, Schwede, Sprenger, Urbach, Weimert, Welzel and Wenzel 2017).

Cloud Computing

The term cloud computing describes "the delivery of computing services—including servers, storage, databases, networking, software, analytics, and intelligence—over the internet ('the cloud') to offer faster innovation, flexible resources, and economies of scale" (Azure Microsoft w. Y.). It reduces costs of investments in both hardware and software, allowing for flexible scaling. Topics like data security, reliability and modernisation are usually included in the provider's contract, thereby allowing the user to focus on the core business, resulting in increased performance and productivity (Azure Microsoft w. Y.). Thus, the selection of a service provider must be made with care, as the success of the business may depend on this selection (Bundesministerium für Wirtschaft und Energie w. Y.).

Global providers are Microsoft Azure or Amazon Web Service (AWS), but with the emergence of data centres in many African countries, the cloud computing trend is widespread on the continent. However, in many cases, valid research data about cloud computing in Africa is lacking. Allison, Bass and Dahiru (2014) found an increase in use of cloud computing services in Africa, but also pointed out that policies, data security and privacy are still lacking and issues with data loss are prevalent. Cloud computing is viewed as a big opportunity for MSMEs.

In the past, most Africans only had access to 2G; today, more people have access to broadband internet. In 2022, an increase of 60% of mobile money users is expected, and further investments in internet infrastructure are planned by African governments. Furthermore, smartphones are becoming more affordable, and more data centres will be established. The demand for online services with the IT skills of the population has also increased (The African Exponent 2021). Additionally, the number of data centres and their capacity are increasing on the African continent, although the capacity is still less than 1% of the global capacity and → Security remains a significant issue. Nevertheless, the capacity on the continent has doubled in the last three years (ITU 2021). All these preconditions show the rising demand for cloud computing.

e-Learning and m-Learning

The term e-learning describes "the use of information and computer technologies [ICT] to create the learning experience" (Angelo State University w. Y.). It allows new learning experiences and methods of delivery and can appear in different forms and with different levels of implementation. The following section is based on e-learning information from the Knowledge Management department of DSIK.

Characteristics of e-Learning

As long as a technical device is available, e-Learning solutions can be used anytime and everywhere. These platforms can be set up to rely on internet connection or not (usually in combination with a download feature for content). Based on internet connectivity, e-Learning solutions differ. The oldest forms are platforms on CD-ROMs; others are intranet- or internet-based. One of the advantages of such platforms is the multiple possibilities for content design. Examples for content design include video or audio files, articles and case studies, quizzes, animations and digital white boards. Depending on the format, e-Learning requires greater discipline for self-paced learning. Compared to traditional classroom approaches, the quality of e-Learning relies on content, content design and the teaching skills of the tutor. Additionally, the design and setup of the content, a stable network connection, a working device and the digital skills of the tutor highly influence the quality of e-Learning.

Formats of e-Learning

DSIK differentiates four formats of e-learning. The most basic is a *knowledge database*, which can be, for example, a (step-by-step) instruction guide or simple index explanations in applications. Furthermore, e-Learning solutions can be used as an online support in combination with traditional classroom training (blended learning). There are no limits to what kind of e-Learning technology can be used; it can take the form of information pages like forums, online libraries and online bulletins boards; communication channels such as e-mail, chats or instant messaging; digital quizzes; video material; or digital animations. The next level of e-Learning is asynchronous e-Learning, which is usually based on a platform or network that allows online access and properly fitted offline features. Students and tutors are online whenever they have a connection, exchanging information in forums or answering questions. Students can gain access to libraries or case studies, working with the platform without everyone being online. The highest form of e-Learning in terms of interaction is synchronous e-Learning. For this form, an internet connection or connection to the same network is required. Synchronous e-Learning offers real-time live instructions from tutors and direct exchange between participants working together. These platforms offer conference solutions and features like online white boards or digital hand raising. All formats of e-Learning can be scheduled and designed for trainings over several month or years, as well as simple solutions used in addition to traditional classroom trainings or single tasks.

Furthermore, a mobile trend is occurring in the field of e-Learning solutions that focusses on a learning experience solely on mobile devices like smartphones and tablets. Other possible content designs include smartphone applications, education hotlines and gamification solutions.

e-Learning in Africa

The concept of e-Learning is still relatively new in Africa. Only a few individuals have experience in this form of self-paced learning. Furthermore, most relationships in many African countries are based on personal relations, so digital communication and trust are still limited. The e-Learning platforms are often used in areas where higher education is already existent—mainly at universities and established higher academies that are mainly used by more privileged Africans but do not reach broader parts of the population. Research how to overcome the challenges and barriers regarding e-Learning is limited; the general aspects of cultural learning habits and appropriate learning content must be prioritised.

Benefits and Hurdles

Besides the already mentioned challenges and benefits of digitalisation, as well as the digital divide, further specific benefits of e-Learning must be addressed. One of the aspects is the higher standardisation and thus standardised quality of e-Learning. After the setup, e-Learning solutions can be reused several times. Concepts like online tutors that can vary in quality are dependent on the mood of the teaching individual and situation, a challenge known in traditional classroom learning. Another advantage of highly standardised solutions is the possibility of multi-language use. In contrast, e-learning faces specific hurdles; it represents a new learning experience that requires experienced tutors and students. As the concept is new, the knowledge of both teachers and students on the topic is lacking. Furthermore, e-learning platforms require a higher level of self-discipline and self-organisation, as the learning is often independent of location and time; this is especially the case for long-term trainings that might feel like a burden. Less interaction might lead to less commitment and less communication; thus, the motivation might be lower, and questions might not be asked.

A crucial success factor for e-learning platforms is appropriate content and a learning experience that fits into the learning culture. However, e-learning is not expected to replace traditional classroom approaches in Africa soon. Instead, it is understood as a useful addition to traditional learning approaches.

Internet of Things (IoT)

The Internet of Things (IoT) is a system of devices that are connected to each other in a network. These devices can be digital machines, household items, other objects (e.g., car sensors) and even animals and people if a unique tag is used (e.g., heart monitor implant, biochip transponder of farm animals). The devices in the network exchange information without human-to-human or human-to-computer interaction (Gillis w. Y.). In the field of finance, IoT allows banks to automate internal business processes, financial requests and the transfer of ownership of financial assets. Through IoT, loan monitoring and automated credit card disablements of payments are automated (Rose 2019).

The adoption of IoT concepts in Africa has been slower compared to the Global North and is still in early stages. However, it accelerated in the last few years as infrastructure improved and mobile devices became more accessible and affordable. Professional adoption of IoT in Africa has occurred in different sectors in Africa. For example, in Eastern Africa, an improved waste management system was established in Nairobi, Kenya, by city officials and IBM. The waste management vehicles were equipped with real-time monitoring solutions and connected with software that created a digital map of Nairobi. Due to the tracking, routes can be analysed, as well as the time a vehicle is stuck in traffic. It also ensures that work is completed in an appropriate timeframe and monitors the driver's behaviour. After a first test phase, the positive effects were remarkable, and the amount of collected waste increased tremendously (Vizocom, w. Y.).

Currently, no research or innovative examples of the use of IoT in microfinance exist. However, the author would like to emphasise that the use of IoT is not expected in the medium term, as the financial inclusion and fundamental digitalisation of MFIs/SACCOs must progress further before they reach a range in which implementation of advanced digital concepts like IoT can be considered.

Mobile Market and Internet Access

The mobile market plays a significant role in digital transformation and is quite diverse (ITU 2018). In the last 10 years, many innovations, particularly in digital finance, have emanated from MNOs. Low-tech mobile channels like voice, SMS and USSD act as enablers and drivers for digitalisation and digital inclusion and are unique in many developing countries around the globe. Additionally, mobile solutions are practical, as a broad network of landlines is missing (GSMA 2019).

According to Alsop (2019), only about 7.7% of households in Africa had a computer in 2019. This number had increased slightly over the previous 10 years, from 5.2% in 2009, but it has stagnated. Although the number of individuals might be higher, as some equipped households will have more than one laptop available, many more individuals own a cell phone (basic/feature phone or smartphone) than a computer.

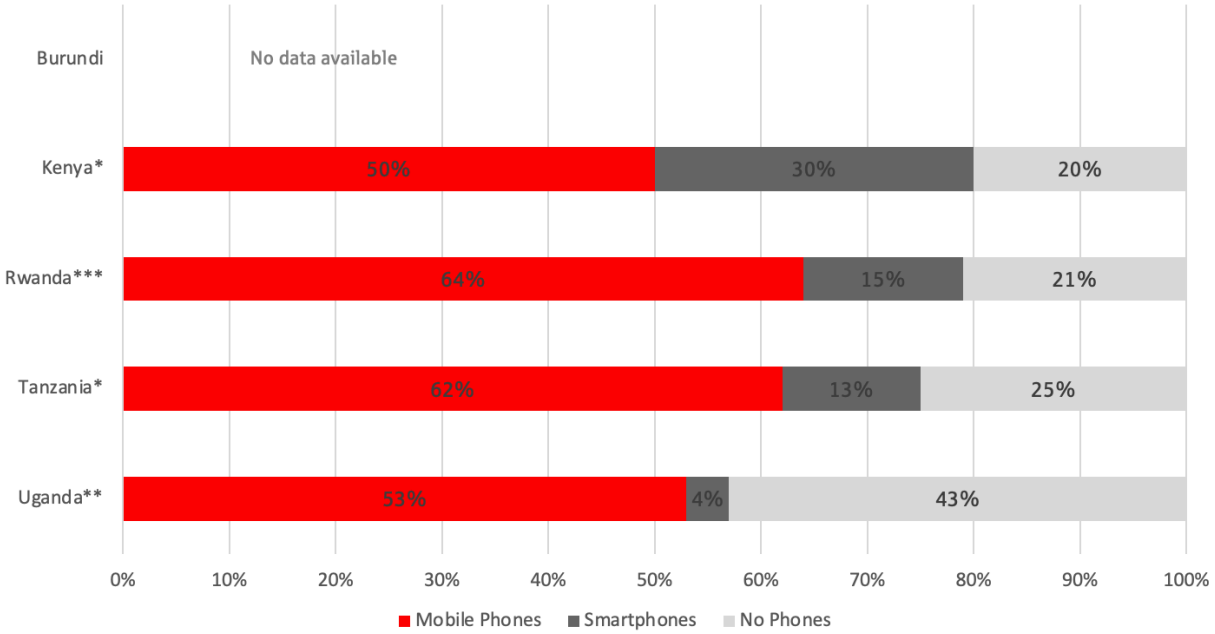

Figure 8: Mobile phone penetration in Eastern Africa
(Source: DSIK illustration based on *Silver and Johnson 2018; ** Poushter 2016; ***Anadolu Agency 2020)

As Figure 8 shows, normal cell phones are still common in many African countries, while only a small group own a smartphone. Most phones are owned in Kenya, where 80% of the population own a device. Around 30% own a smartphone in Kenya, while 50% own a basic mobile phone. Around 20% own no phone, which is still every fifth person. In Rwanda, 79% of the population own a mobile phone—15% of the population own a smartphone, which is only half the number of Kenya, while further 64% owns at least a basic mobile phone. Twenty one percent own no phone, which is a little over every fifth person. In Tanzania 75% of the population own a mobile device—13% a smartphone and further 62% own a basic mobile phone. Consequently 25%—every fourth person—own no phone in Tanzania. Uganda has the lowest number of people owning a mobile device at 57% within the group of mentioned East African countries. Only 4% own a smartphone and further 53% owns at least a basic mobile phone, which marks the lowest numbers for smartphones and basic mobile phones in the comparison in figure 8. Consequently 43% of the population in Uganda own no mobile device. However, data for Uganda are from 2015; thus, an increase can be expected (Silver and Johnson 2018; Poushter 2016; Anadolu Agency 2020).

The situation of the broader population becomes more tangible considering that the cheapest smartphone on the African market from a Chinese company costs around $40. However, the phone with newly released features made from a collaboration between MTN Group Ltd. and Orange in 2019 only cost around $20. This phone runs with the KaiOS operation system, a Chinese Android-platform made in collaboration with Google that is expected to reach 105 million devices within the same year of release and is the fastest growing operation system. The device is 3G capable and has a solid battery that lasts up to three days. It has decent user value and works with various apps, including Google Maps, What's App and YouTube, among others. Furthermore, Google plans to implement a communication exchange with Google Assistant for voice typing (OER Africa). The success of this device reveals the difference $20 makes for large portions of the population, determining whether those individuals are digitally included. Thus, the market is dominated by Chinese low-cost manufacturers in terms of mobile devices (Jalakasi 2018).

The above statistics lead to the assumption that every fifth person in Kenya and Rwanda, every fourth person in Tanzania and more than every third person in Uganda are not reachable via digital/mobile channels. According to James (2011) and DSIK practical project experience in Eastern Africa, hardware devices are shared among friends, family and communities, especially in poorer areas. Thus, although individuals do not own a mobile device, they own a SIM card, which allows them to use mobile channels to some extent. Therefore, SIM card ownership must be considered when assessing mobile inclusiveness. However, the statistics show an ambivalent picture.

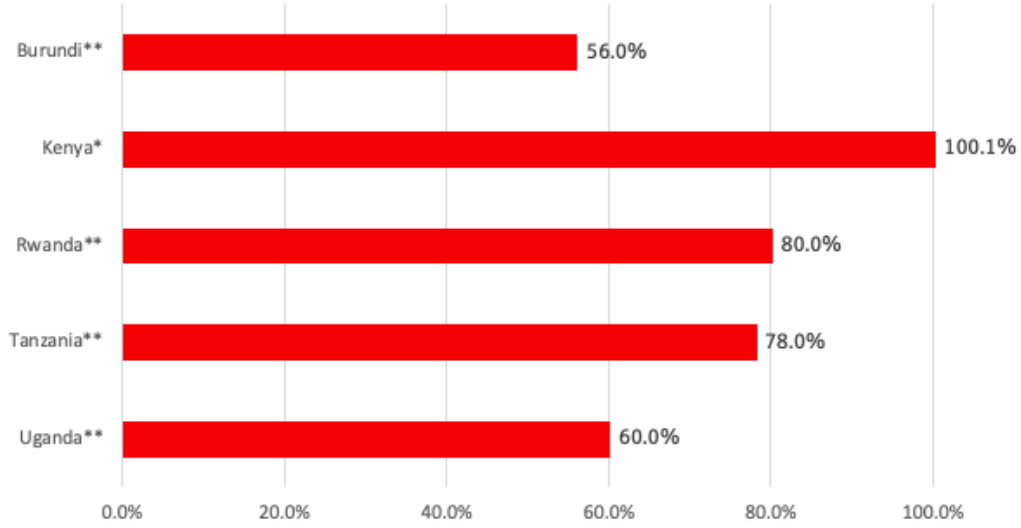

Figure 9: SIM card penetration in Eastern Africa
(Source: DSIK illustration based on *Silver and Johnson 2018; **CIA World Fact Book, w. Y.)

As shown in Figure 9, Burundi and Uganda have the lowest SIM card penetration, at 56% and 60%, respectively. For Uganda, this marks a theoretical increase of individuals reachable via mobile channels of only three percentage points compared to the mobile phone statistics, which indicated 57%. Rwanda (80%) and Tanzania (78%) have a slight increase of one percentage point and three percentage points, respectively. Only Kenya at 100.1% marks a theoretical increase of about 20 percentage points (Silver and Johnson 2018; CIA w. Y.). However, the big percentage of SIM cards in Kenya should not be interpreted as full digital inclusion. Assessing how many individuals are included in mobile channels based on the available data is challenging. A certain degree of variability must be assumed in this interpretation, as individuals presumably own more than one SIM card, SIM cards

can be out of use and data were collected in different years. Thus, this uncertainty cannot be quantitatively calculated based on the available data. The statistics reveal a slight trend that there are more SIM cards than mobile phones on the market, but further research is necessary to make an objective statement.

Since most people in sub-Saharan Africa are only reachable through low-tech mobile channels, innovations around these channels are still rising. Thus, most innovations are still based on USSD (unstructured supplementary service data), a mobile network internal communication protocol based on codes that allows access to services without an internet connection (Jalakasi 2018). Mobile money payment solutions are particularly increasing, but other applications are on the rise as well. What makes mobile channels so successful and, therefore, MNOs is the low-tech innovation and access to the customers. However, innovations do not come only from the MNOs. The opening of the USSD networks by MNOs via API interfaces has led to the development of a flourishing start-up scene that has made a valuable contribution to demand-specific digital solutions and provided socio-economic impact. However, sometimes only the development is cheap; when activating the solutions in the USSD network, the fees often rise sharply (GSMA 2019). This princing model shows the intensity of competition that exists in the African market, which is considered one of the last major growth markets, with a potential of one billion individuals. Thus, Africa is becoming increasingly competitive. Companies such as MTN Rwanda are planning to set up their own FinTech companies to develop the mobile money spare further, while companies including Facebook, Microsoft and SAP are flocking to the market to best position themselves for the future (MTN Rwanda 2021; GSMA 2017).

Prices for ICT and internet packages have followed a downward trend over the last four years. Nevertheless, the costs of internet bundles on the African continent are still the highest globally, and incomes are low. Thus, larger parts of the population are not able to afford these bundles. However, the general number of internet users is increasing (ITU 2018).

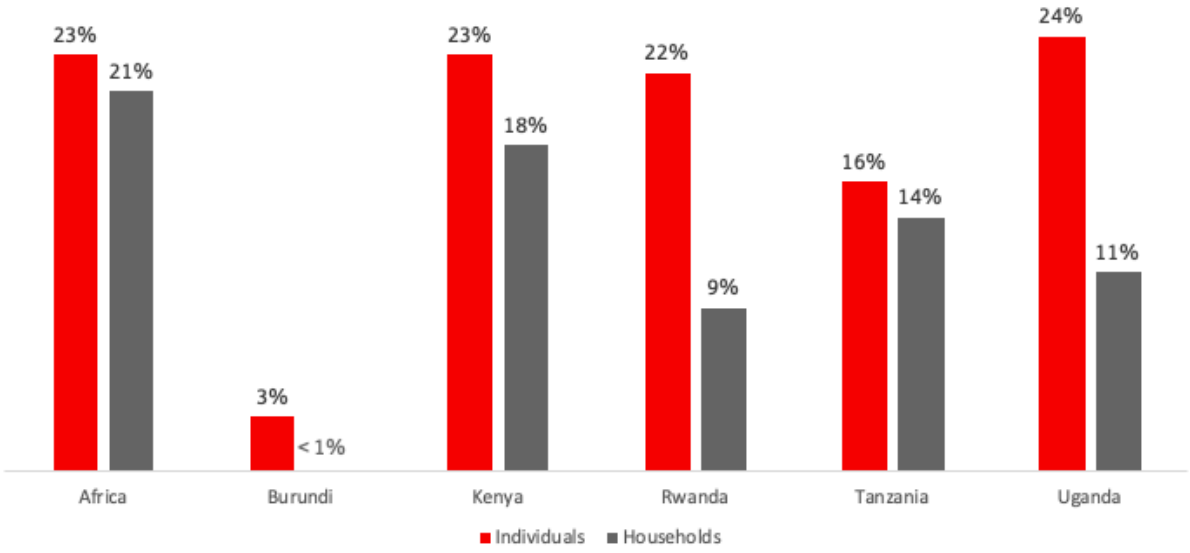

Figure 10: Percentages of individuals and households using the internet
(Source: DSIK illustration, based on ITU 2021; Data for Kenya from 2019, for Burundi, Rwanda, Tanzania and Uganda from 2017)

In Africa, around 23% of individuals and 21% of households use the internet. At the individual level, only Uganda lies above the average at 24%, with Kenya (23%) and Rwanda (22%) following closely behind. In Tanzania 16% of individuals still use the internet, while Burundi at 3% is far behind, not just in East Africa but also throughout the African continent. Considering the number of households using the internet, all mentioned East African countries in figure 10 are below the average of 21%. Kenya has the most connected households with 18%, which marks a decrease of 5 percentage points compared to individuals using internet access in Kenya. Kenya is followed by Tanzania at 14% of connected households, a decrease of two percentage points. Next is Uganda at 11% of households using the internet, a decrease of 13 percentage points. In Ruanda, only 9% of households use the internet, which also marks a decrease of 13 percentage points. Far behind is Burundi, with less than 1% of households using the internet (ITU 2018).

Other studies, such as the one from PEW Research Center (2019), revealed higher numbers. According to their study, 39% of individuals in Kenya and 25% in Tanzania are using the internet (Silver and Johnson 2018). This reveals the challenging data situation in Africa and highlights where further research is needed.

Regardless of the divergent data, the COVID-19 pandemic has led to a surge in demand for mobile networks. Vodacom recorded a 40% increase in their mobile network and a 250% increase in the fixed network during lockdown. This led to an increase in network congestion during peak periods in mobile and fixed networks after people shifted to home offices (ITU 2018).

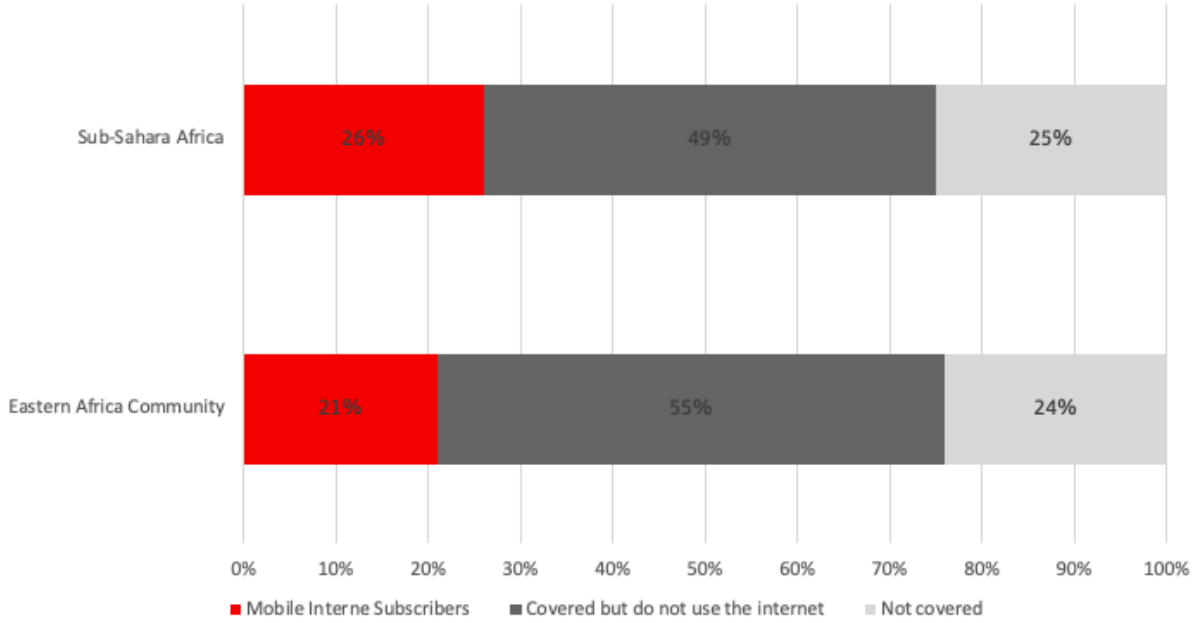

Figure 11: Percentage of internet subscribers, non-subscribers and uncovered population in 2019 (Source: GSMA 2020b)

Many hurdles must still be overcome. As Figure 11 shows, 75% of the population is theoretically covered by internet access, but only 26% are actually mobile internet subscribers, 49% could be connected but are not, and an additional 25% are not even covered. Compared to the African average, East African countries are behind in terms of actual mobile internet subscribers with minus five percentage points at 21% of actual subscribers and minus six percentage points at 55% who are

covered by internet network, but do not have any subscription yet. Only the number of individuals who are not covered is one percentage point less, at 24% (GSMA 2020b). Thus, infrastructure and access are not the only challenges faced.

The yearly GSMA Mobile Connectivity Report (Fig. 12) identified four different key enablers of mobile internet adoption: infrastructure, affordability, consumer readiness and content and service. The key enabler infrastructure describes the availability of mobile internet network coverage. Affordability means the availability of mobile services to a price, that reflects the income level of a respective country. Consumer readiness describes the digital skills and awareness of the population in regard to the value and use of the internet and is related to the term e-Literacy which is used in this report. Content and service means online content and services which relevant and secure for the local users. The index ranges between 0 to 100; the higher the score, the better the performance in terms of mobile internet connectivity. Figure 12 supports the indication, that the largest hurdles in terms of mobile inclusion are affordability and e-literacy.

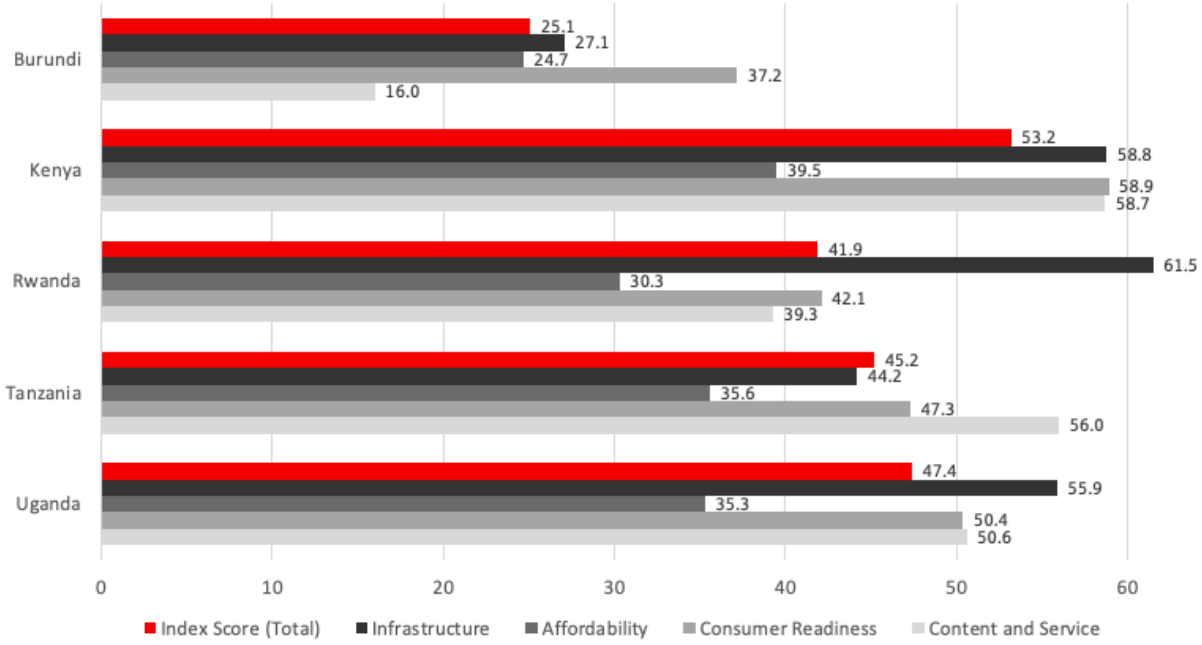

Figure 12: Mobile connectivity index scores of DSIK project countries in 08/2022
(Source: DSIK illustration based on Mobile Connectivity Index by GSMA 2022)

The highest mobile connectivity index in DSIK project country was measures in Kenya at 53.2. Within the four key enabler, infrastructure (58.8), consumer readiness (58.9 and content and services (58.7) are comparable high, while the affordability at 39.9 is relatively low. The second highest mobile connectivity index was measured in Uganda at 47.4, a decrease of 5.8 index points to Kenya. In regard of individual key enablers, infrastructure is at record with 55.9, followed by content and service at 50.6 and consumer readiness at 50.4. The affordability was measured at 35.3, low compared to the other key enablers. Tanzania has the third highest mobile connectivity index of the five project countries at 45.2, a decrease of 2.2 index points to Uganda. The highest key enabler is content and service at 56.0, followed by consumer readiness at 47.3 and infrastructure close behind at 44.2. Affordability at 35.6 is further behind and comparable to the numbers of Kenya and Uganda. Rwanda has a mobile connectivity index of 41.9. Infrastructure at 61.5 is the highest of the five project countries, followed by consumer readiness at 42.1, content and service at 39.3 and the lowest key enabler for Rwanda is again affordability at 30.3. The lowest mobile connectivity index

was measured in Burundi at only 25.1. Consumer readiness is the highest for the four key enabler at 37.2, the lowest in this country comparison, followed by infrastructure at 27.1, affordability 24.7, which also marks the lowest of all five countries, but which is still higher then content and service at 16.0 (GSMA 2022).

Statistics have revealed the importance of low-tech solutions, particularly in mobile markets, for achieving digital inclusion and accelerating digital transformation in Africa. Furthermore, these solutions are a necessary component to achieve the SDGs, as such technologies are the only way to reach end-beneficiaries at the bottom of the pyramid. These beneficiaries are dependent on accessible and cost-effective solutions for digital inclusions. Important partners in the context of development cooperation are MNOs and start-ups, who can create the best possible solutions for socio-economic growth and education, thus contributing to poverty reduction (GSMA 2019). The role of DSIK in this context is to unite the appropriate organisations to provide the best possible service for MFIs/SACCOs as well as partnering apex organisations. The intended way forward is to work in collaboration with MNOs, start-ups and government, as they all play an important role in the financial eco-system.

To appropriately elucidate the role of mobile markets in the African context, individual topics such as USSD technology, mobile money, network coverage and a deeper analysis of mobile devices and internet use must be examined regarding inequalities based on gender, age, place of residence, education level and income. These will be discussed in chapter 3.6.

Security

Regarding the topic of security, terms like “IT security”, “cyber security” and “information security” are often used as synonyms for standards and methods used to avert multiple potential threats. However, these terms are not the same and must be seen under an information security framework.

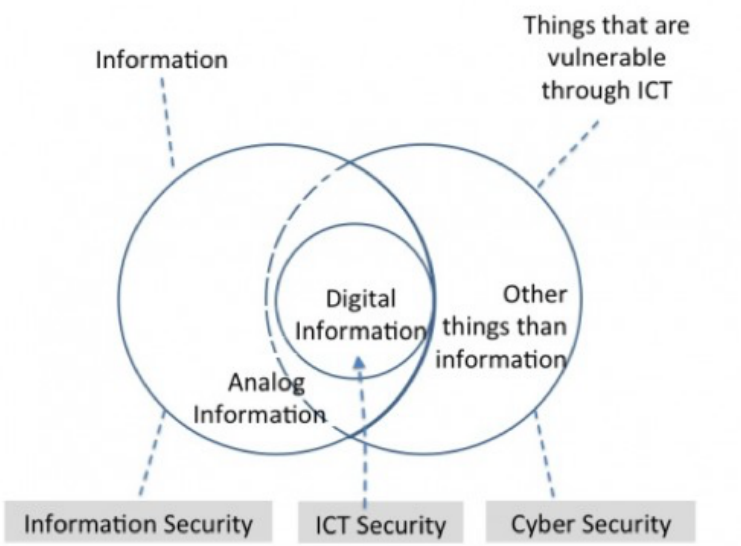

Figure 13: Corporate security elements of technology
(Source: Cisco 2016)

Data and Information Security

The term “data” includes anything from numbers to words in different formats. These elements are not analysed within a context. Thus, data are comparable to a rough diamond; they are valuable but must still be processed to unfold their potential. The protective goals are confidentiality, integrity and availability. Confidentiality means that only allowed people have access to the data. Integrity ensures that data are not changed or manipulated. Availability indicates that access to the data is ensured and that the data can be used at all times (COC w. Y.).

If data are placed into context, they become even more valuable. Information security encompasses the security of all available information of an organisation, regardless of whether they are digital or physical. Examples of this information include data, printouts, employees, customers, know-how and buildings, among others. Regardless, the protective goals are the same (that is, confidentiality, integrity and availability). Guidelines for appropriate measures to ensure information security can be found in the IOS/IEC-27000 norms, which have international validity (COC w. Y.).

IT Security

IT security protects the components of the IT infrastructure, including both the hardware (server, computer, laptops, mobile devices, etc.) and software components (e.g., operating systems). IT security is part of information security but focusses on digital information (CISO Platform 2016).

Cyber Security

Cyber security is an extension of IT security that addresses threats arising from the entire cyber space. IT protects and secures data, which are vulnerable through ICT (CISO Platform 2016). According to the ITU GCI 2018, cyber security contains the following five pillars: legal, technical, organisational, capacity building and cooperation. According to the report, Kenya and Rwanda have demonstrated a high commitment to all five pillars, followed by Tanzania and Uganda, which have shown complex commitment and engagement as reflected in different initiatives and programmes. Only Burundi is still in the early stages of initiatives and commitment to cyber security (ITU 2018).

In 2019, the mobile money system of MTN Uganda and Airtel were hacked, and emerging evidence showed that the hackers may have had insider knowledge and gained access to the payment system through a leak of Pegasus Technologies, a customer finance aggregator. The hack, which created a financial damage of at least $3.2 million, is an example of the need for information and IT security and a reason behind the mistrust in digital solutions (Kafeero 2020). The importance of security in the context of digitalisation is rapidly growing in Africa, but it still does not have the required quality. In its project work, DSIK in Eastern Africa found that the perspective of information and IT security is limited to potential hacking events while the value of personal data and other perspectives on security still need to be developed.

3.6 Important Technologies for Digital Finance in Eastern Africa

Previous chapters have described the unique opportunities and challenges of digitalisation in Africa. Specifically, the mobile market has a special role in financial inclusion due to its customer access and innovations. This chapter will therefore investigate the mobile market and its current characteristics and role in the market.

USSD versus Smartphone Applications

USSD is a user-to-network mobile communication protocol with an interactive menu and communications length of 182 alphanumeric characters (GSMA 2017).

The technology is an older standard, invented in the 1990s. The main intention of USSD was to enable a technical communication between an MNO and subscriber's handset. Thus, it was developed simply with limited functionality as it was mainly used by technicians and MNO internal developers. Currently, use cases of USSD exceed what it was intended for. In the Global North, most MNOs and users never saw strong use cases for USSD; thus, it was never developed further in its functionality and graphical display. In this way, the African market is unique (Jalakasi 2018).

The African market is not only mobile but also prepaid. As a network of internal applications, USSD supports balance checks, top-up credit, data bundles and promotions (Jalakasi 2018). In 2009, Safaricom was the first MNO to publish their m-Pesa payment system, thus revolutionising the digital payment landscape in Kenya. This payment system is based on an internal USSD application, allowing payments without internet access, and its market share and dominance are comparable to that of a monopoly. While other MNOs in African countries have imitated the m-Pesa model, the markets in those countries are more diverse (Booth 2020).

One of the main success factors of USSD is its simplicity; it works with every phone with GSM standard and without internet, thus reaching millions of financially excluded people and adding instant value for the thousands of customers who own a Safaricom SIM card. Safaricom SIM card penetration was already high, as it allowed access and delivered value for customers instantly after product launch, significantly increasing the popularity of the company and its product (Jalakasi 2018).

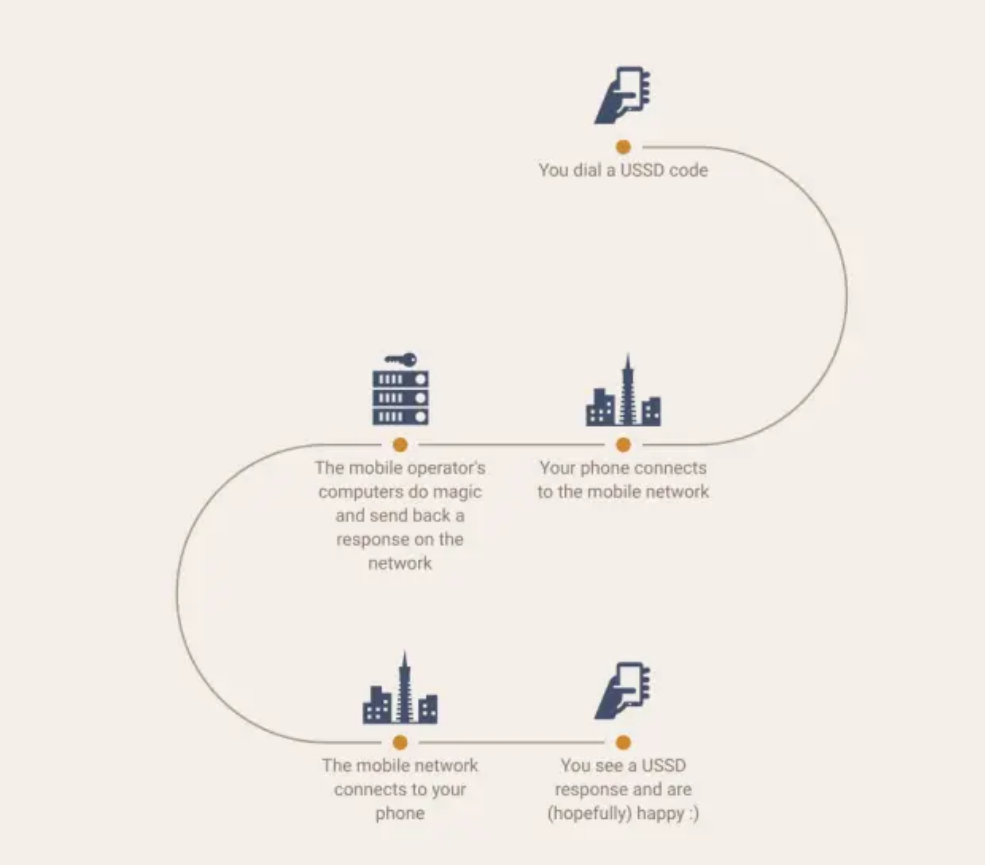

Figure 14: Simple USSD process
(Source: Jalakasi 2018)

USSD is simple: the user dials a certain code, depending on the service the user wants to use. The code is then sent through the mobile phone connection within the network and reaches the MNO data centre, which responds to the request and performs the task. The answer to the request is then sent back through the internal network and is displayed on the user's screen.

As the functionality of USSD is limited, the internet suppresses USSD, as the internet offers much more functionality and convenience for users. The transformation from simple solutions such as USSD to the usage of the internet will only occur when the African population is digitally included through internet and smartphone access. Currently, this is still a long way off, as shown in the section → Mobile Markets only about 80% of the population are included, the vast majority of which are included through basic/feature phones. The value of USSD is its simplicity, accessibility and affordability, which make it powerful. It requires no application downloads, as the app is deployed in the network and not to the user's handset. Therefore, large mobile storage capacity is not required. The service is available directly after deployment in the network without further preparation. The opening of USSD networks by MNOs to third-party developers has paved the way for more diverse use cases, and USSD-based applications add more value to different areas of life outside of payments. This trend has been boosted by the linking of internal USSD networks to modern IT solutions (Jalakasi 2018).

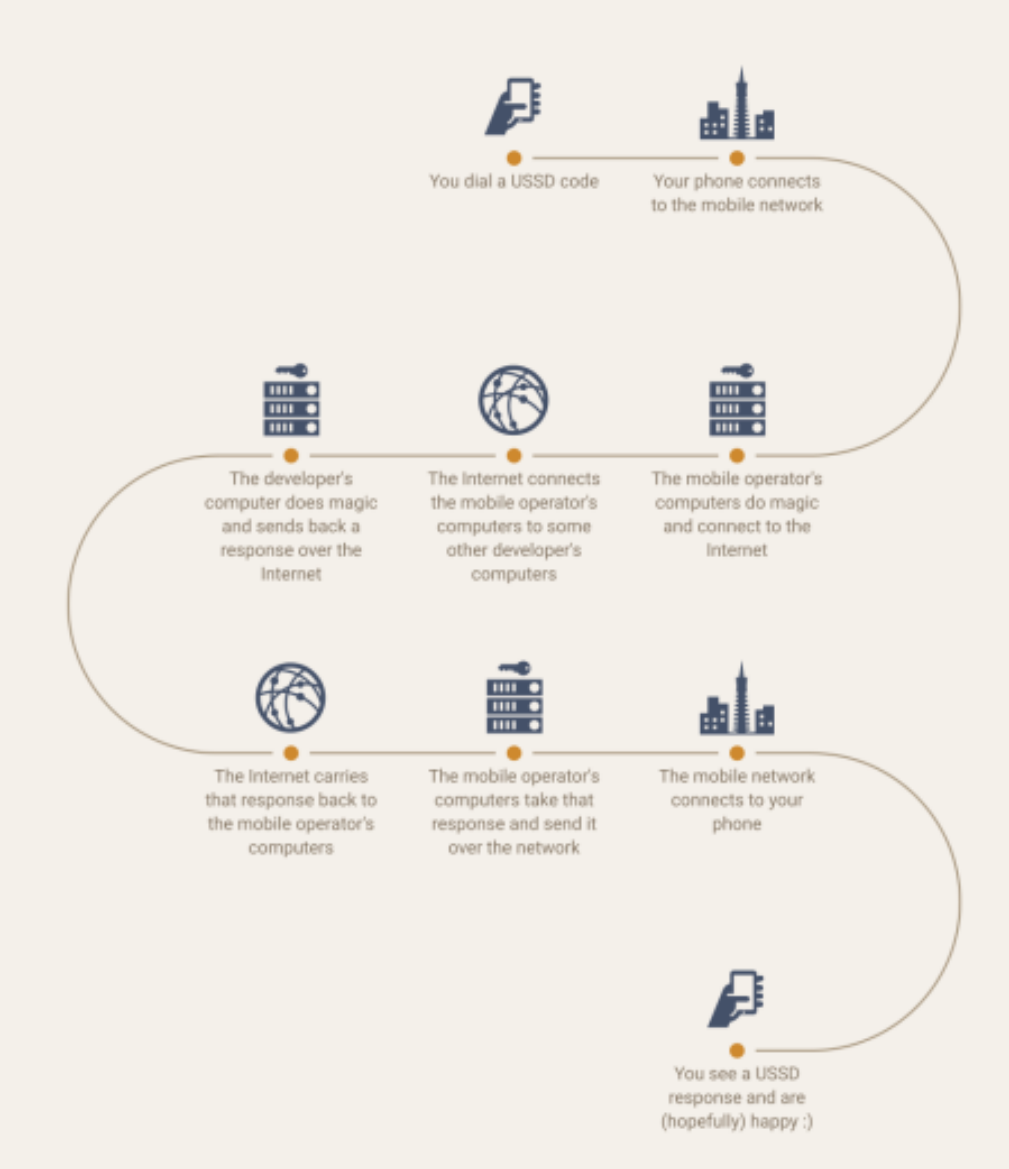

Figure 15: Modern USSD workflow
(Source: Jalakasi 2018)

The connection of USSD networks with modern IT and internet convergence allows user requests that would typically require an internet connection. The user still dials a code, which is processed through the USSD network to the MNO's data centre. The computers are connected to the internet, perform the requested service, receive the answer through the internet and process this through the internal USSD network back to the user.

Additionally, the technology can be layered on top of existing smartphone applications, thus allowing developers to build applications for users' handsets, mobile phones and smartphones. Depending on device availability and user preference, the user can access the application through a USSD code or a smartphone app. Even though the development costs are higher compared to the development for just one phone type, the development of two technical solutions allows a wider target group to be reached and accompanied by this technology through different stages of their personal development, as more individuals switch to smartphone devices when reaching a certain level of wealth (GSMA 2017).

The COVID-19 pandemic has emphasised the importance and impact of USSD applications. Many applications were developed on a short-term basis to deal with the pandemic and related lockdowns. Thus, USSD usage and development increased. USSD-based applications for symptom checks and direct connection to health systems were implemented in countries like Kenya und Rwanda. The Kenyan government also developed an application to provide alerts of outbreaks (Hinrichsen 2020). MNOs like Safaricom lowered the mobile money transaction costs as cash payment had to be avoided to enable more people to become financially included (Finextra 2020). Furthermore, applications for clearance allowance were established in Rwanda to request clearance for essential grocery shopping, doctor appointments and so on.

However, USSD also has its limitations. Its functionality is limited, and use cases already exceed the intended purpose of the technology. Thus, it has reached its limits in some more diverse use cases. USSD offers a text-only user interface, with no opportunities for other graphic designs, such as pictures or videos, and it is limited to 182 alphanumeric characters. With few exceptions, voice solutions are not common; thus, individuals with low literacy levels or visual disabilities cannot be technically included. Data security is another limitation in USSD networks, as data cannot be encrypted and are visible on the backend. Thus, security of USSD-based systems highly depends on the integrity of developers and individuals with access to those backends. Additionally, the costs to develop USSD applications are higher than expected. The open API interfaces allow developer access, but in terms of getting an application online, complicated approvals with high fees are required for deployment (Olayinka 2021).

Mobile Money

The importance of mobile markets for digitalisation in Africa has already been discussed repeatedly in the previous chapters, and low-tech solutions have a particularly important role in digital inclusion. One of the most widespread and successful mobile solutions is mobile money payment systems, which have played a major role in shaping digital financial inclusion, as the case study of m-Pesa reveals.

Safaricom was the first MNO not only to recognise the risks and inefficiencies of cash, such as expensive transportation costs, security and conservation, but also to create an efficient solution for this with their mobile money payment solution, m-Pesa (Hinz 2014). As a result, user numbers have grown rapidly since the solution's launch in 2009, reaching a market share in Kenya that is tantamount to a monopoly (Burr 2014). Although such a market power must be critically questioned in terms of fair market competition and pricing, m-Pesa has advanced the financial inclusion of poor and disadvantaged sections of the population in a peerless manner.

The success factors of m-Pesa are diverse. As a simple technology, USSD gains access to customers through Sim cards, and the reputation of Safaricom as a big company leads to a unique standing (Martin 2016). Furthermore, Safaricom established a business model with a focus on and precise analysis of customers' needs, as well as a unique agent network (Burr 2014). Thus, the product range was expanded; a savings product called m-Swhari, loan offers and an application for smartphones are also available (Safaricom w. Y.).

One unique aspect of m-Pesa is that Safaricom does not require a banking license for its offer, as credit products are offered by banks. KCB (loans), for example, offers loans through the platform, but cedes around 20% of the interests to Safaricom as a gatekeeper fee. Similarly, CBA (m-Swhari) cedes 30% to Safaricom. Thus, the risk-takers are the banks, not Safaricom, which mainly acts as gatekeeper for customer access (Kimani 2018).

Customer funds that are transacted through m-Pesa are distributed among several commercial banks and are secured through a trust fund monitored by the government. This ensures that the funds are not misappropriated or misused by Safaricom (Alexandre 2010).

Although this lucrative business model has been successfully copied by MNOs in most African countries, which has made the market more diverse than in Kenya, mobile money has its limits in terms of financial inclusion. A study from Higgins, Kendall and Lyon (2012) in Kenya revealed that especially for small businesses, the affordability of the fees for the business connection was challenging; therefore, the businesses prefer cash or, in some cases, do not offer m-Pesa as a payment option. Diverse markets and greater competition could make the system more affordable for larger portions of the population.

As mentioned above, the successful Mobile Money model has been introduced in many countries. The following is an overview of the largest providers in East Africa.

Burundi*	Kenya**	Rwanda***	Tanzania****	Uganda*****
• Lumicash • Ecocash • Smartpesa	• Safaricom (m-Pesa) • Airtel Money • Orange Money • Essar yuCash	• MTN • Airtel	• Vodacom (m-Pesa – 39% market share) • Tigo (Tigo Pesa – 30%) • Airtel (Airtel Money – 20%)	• Airtel • MTN Vodacom • Organda Uganda • Uganda Telecom • Warid Telecom

Figure 16: Overview of the biggest mobile money providers in Eastern Africa
(Source: DSIK illustration based on *GSMA 2020a, **Nelito 2021, ***Argent, Hanson and Gomez 2013, ****Tanzania Invest 2021 and *****Ndiwalana, A., Morawczynski, O. & Popov, O. 2016)

Each system offers a different variety of products and is backed by national regulations. Mobile money is also particularly suitable for collaborations in development cooperation and for achieving the SDGs, as connected MFIs/SACCOs not only can link different customer accounts but also can benefit from online product diversity and create a type of interoperability.

However, the trend of increasing taxes on mobile money, as levied by governments, should be considered. Initial studies have shown that the resulting increased costs lead to a decline in usage. Increased prices, either in form of taxes or transaction fees, are likely to affect poorer, low-income segments of the population and could also impact the business models of MFIs/SACCOs and MSMEs. Therefore, it should be investigated further.

Network Coverage

The network coverage maps from GSMA show the network coverage in a particular country from certain providers. These maps are accessible via https://www.gsma.com/coverage/. The previous chapters revealed that the coverage of the population with available internet in East Africa is about 76% (see fig. 11). According to ITU (2021), a little over 77% of the population in Africa is within reach of 3G, while 44.3% is within reach of LTE. However, this does not mean that universal network coverage exists, as this chapter reveals. The network coverage alone only provides limited information on whether large parts of the population are connected. However, it provides few implications regarding whether individual project activities in the areas in which projects are to be implemented are accessible.

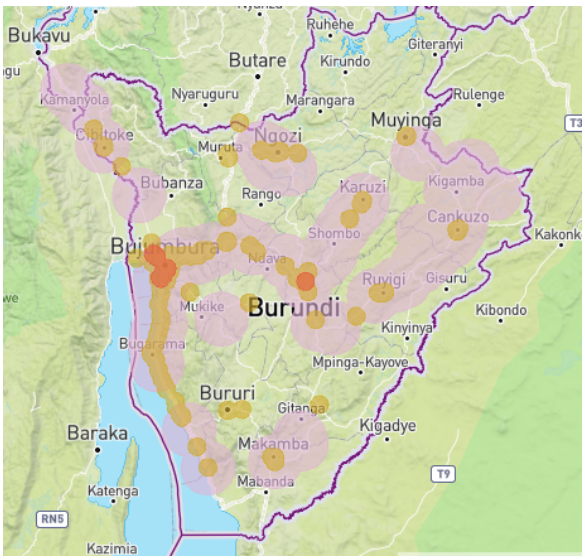

Figure 17: Lumitel network coverage, Burundi
(Source: https://www.gsma.com/coverage/)

pink = GSM yellow = 3G red = LTE

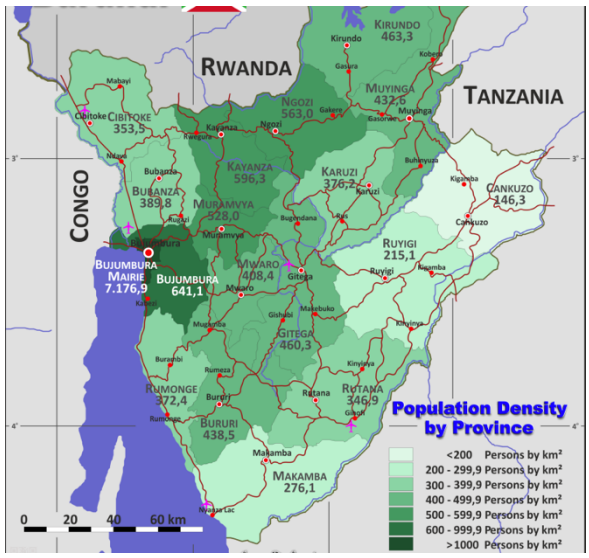

Figure 18: Distribution of population in Burundi
(Source: http://www.geo-ref.net/)

light green = less population dark green = conurbation

Lumitel (Fig. 17) is one of the largest MNOs in Burundi; however, the coverage map reveals that large portions of the country are not yet covered with internet connection. The 3G network only covers the larger cities, and the LTE network only covers cities such as Bujumbura (an economic zone) and Gitega (the main capital). Other networks, such as Econet, may cover other parts with GSM that are not covered by Lumitel; however, the general coverage is low compared to other East African countries.

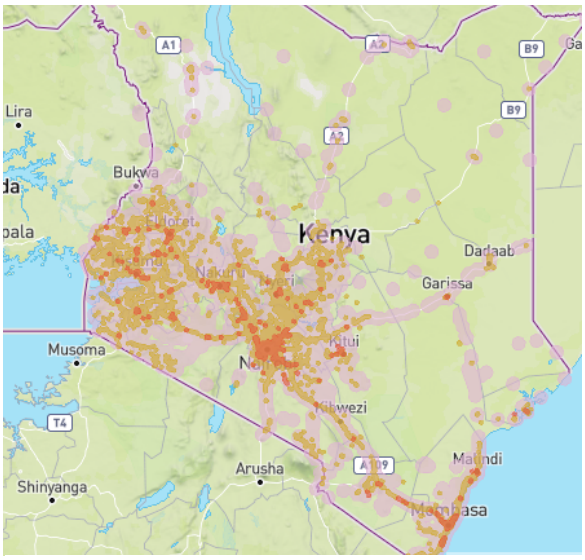

Figure 19: Safaricom network coverage, Kenya
(Source: https://www.gsma.com/coverage/)

pink = GSM yellow = 3G red = LTE

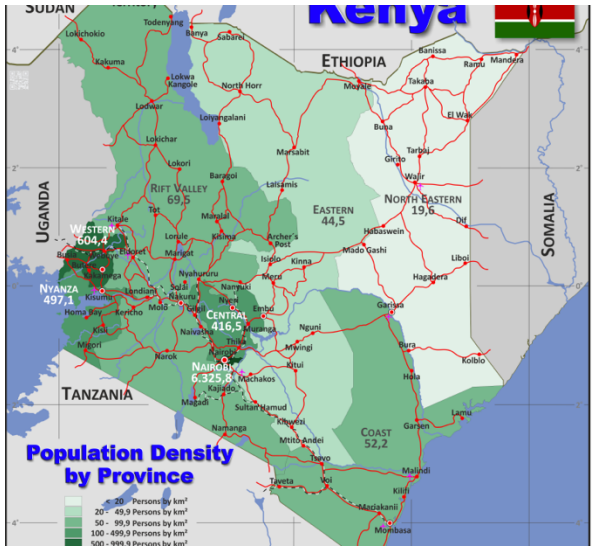

Figure 20: Distribution of population in Kenya
(Source: http://www.geo-ref.net/)

light green = less population dark green = conurbation

In Kenya, Safaricom is the biggest MNO with the best network coverage (Fig. 19). The network coverage reflects the distribution of the population (Fig. 20) and important economic areas in Kenya. The 3G network concentrates on the darker green areas at Lake Victoria, Nairobi and Mombasa, as well as the significant roads between these locations. LTE is only available in the largest cities with the most populated areas. Larger parts of the north-east and north-west are not covered by any network. Thus, 3G and LTE networks are only available in larger cities and important economic regions.

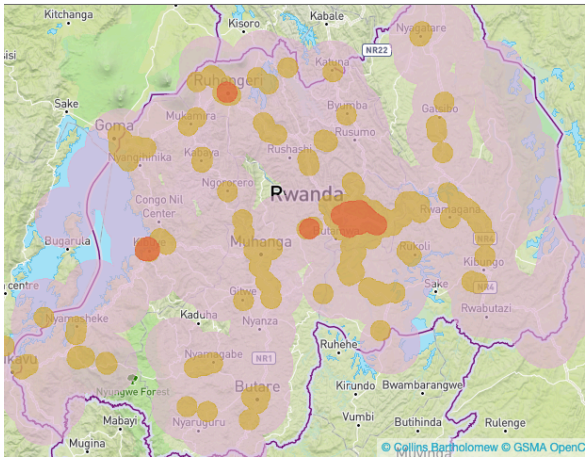

Figure 21: MTN network coverage Rwanda
(Source: https://www.gsma.com/coverage/)

pink = GSM yellow = 3G red = LTE

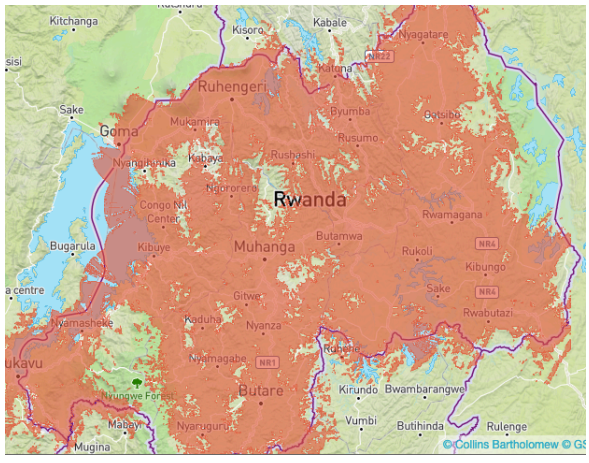

Figure 22: Network coverage kt Rwanda Networks
(Source: https://www.gsma.com/coverage/)

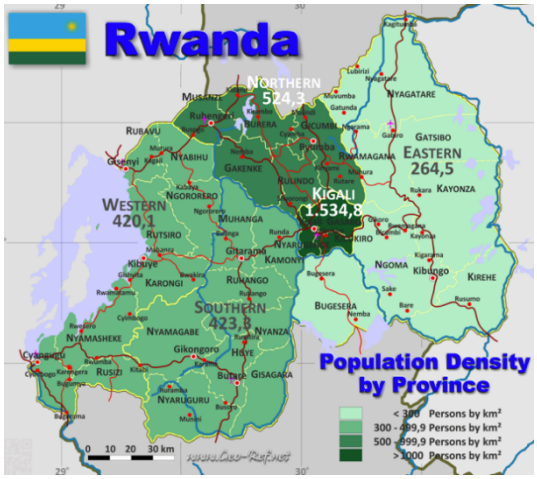

Figure 23: Distribution of population in Rwanda
(Source: http://www.geo-ref.net/)

light green = less population dark green = conurbation

The network coverage maps of MTN (Fig. 21) and kt Rwanda Networks Ltd (Fig. 22) reveal different coverage in Rwanda. While MTN covers nearly the entire country with GSM, only a few places are covered with 3G (the main cities, such as Kigali, Musanze and Gitesi). However, the kt Rwanda network was implemented to achieve a nationwide LTE network to accelerate digital inclusion. In comparison with the distribution of population, Figure 23 shows that places in Rwanda that are not densely populated are covered at least by GSM, as well as LTE through the kt networks. Thus, Rwanda is the leading country in Eastern African in terms of network coverage.

Figure 24: Vodacom network coverage Tanzania
(Source: https://www.gsma.com/coverage/)

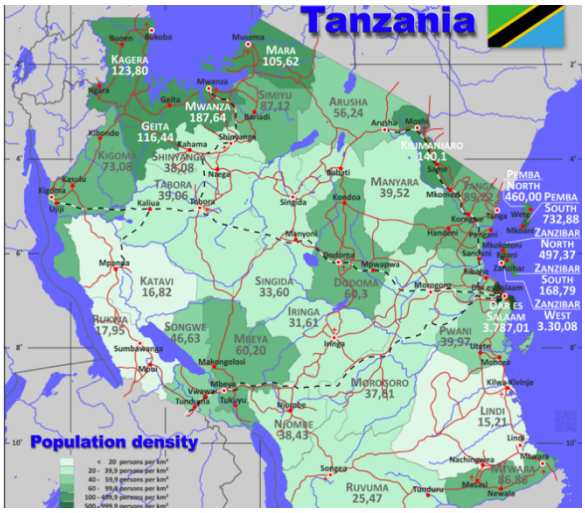

Figure 25: Distribution of population
(Source: https://www.gsma.com/coverage/)

pink = GSM yellow = 3G red = LTE light green = less population dark green = conurbation

Vodacom has one of the biggest networks in Tanzania (Fig. 24). However, the network coverage is low, as larger parts in the centre and south-west are not covered even with GSM. When compared to the distribution of the population (Fig. 25), the most populated parts are at least covered with GSM. However, 3G or LTE networks are only available in larger cities and conurbation.

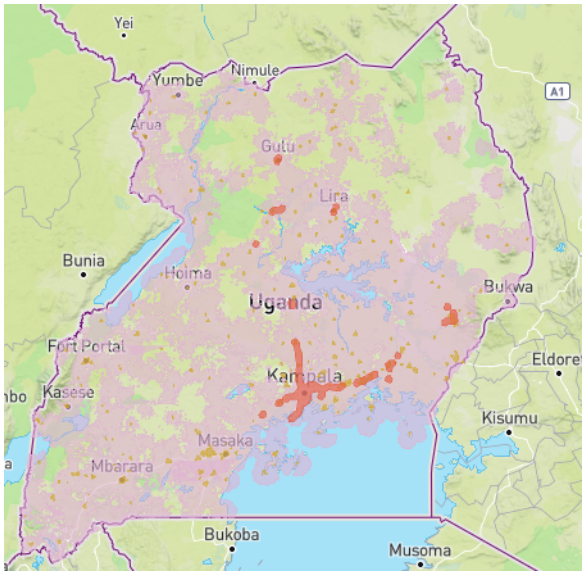

Figure 26: Airtel network coverage, Uganda
(Source: https://www.gsma.com/coverage/)

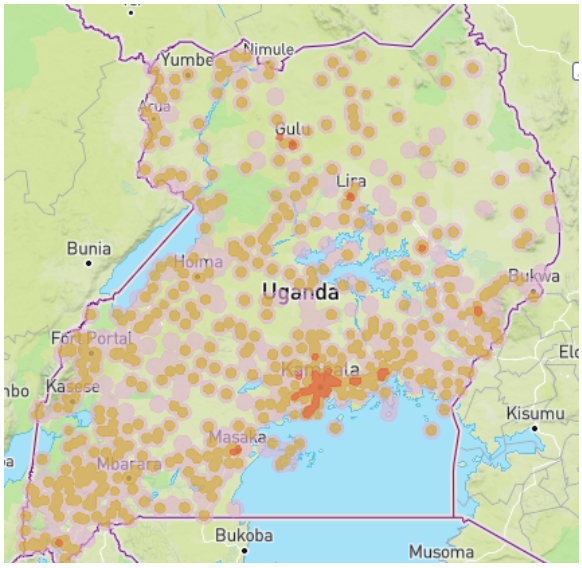

Figure 27: MTN network coverage, Uganda
(Source: https://www.gsma.com/coverage/)

pink = GSM yellow = 3G red = LTE

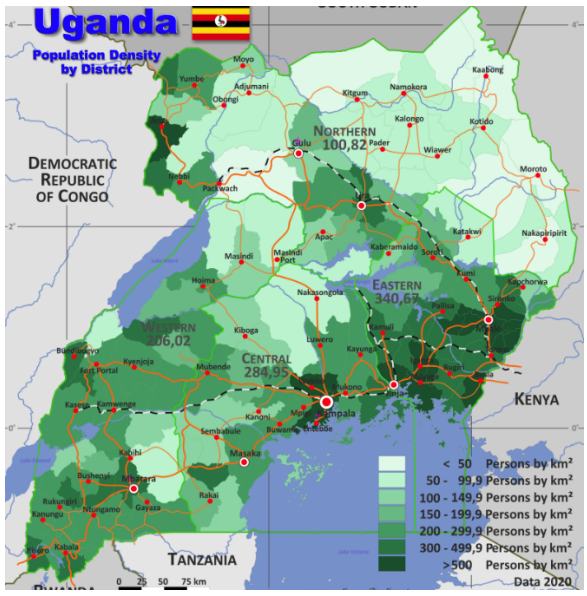

Figure 28: Distribution of population in Rwanda
(Source: http://www.geo-ref.net/)

light green = less population dark green = conurbation

In Uganda, the network coverage of Airtel (Fig. 26) has the largest GSM network in the country, as well as the biggest LTE network around Kampala and Entebbe. In contrast, MTN Uganda (Fig. 27) has a much smaller GSM network but the biggest 3G network and an LTE network around Entebbe and Kampala. These are the most urban and populated parts of Uganda; thus, a large portion of the population is covered. However, especially the north-east area is still underserved.

Mobile Phone: User Behaviour

As section 3.5 revealed, if network coverage is available in the region, around 72.75% of the population own a mobile phone. Of these, 57.28% own basic/feature phones, and 15.5% have smartphones. This section discusses the activities for which these mobile phones are used.

Mobile Activity Behaviour

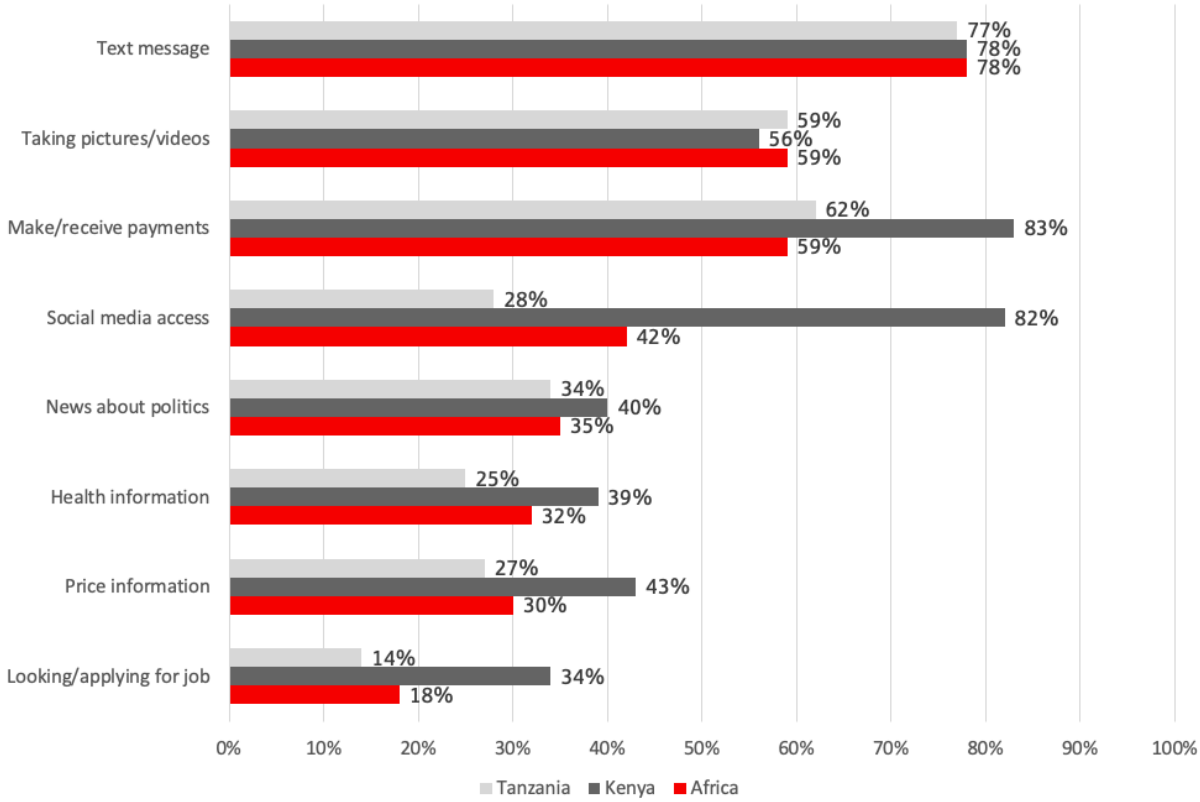

Figure 29: Use cases of mobile devices
(Source: DSIK illustration based on Silver and Johnson 2018 – data collected 2017)

Figure 29 shows the activities for which mobile phones are regularly used. On the African continent, the phones are mainly used for sending and receiving text messages (78%), followed by taking pictures or videos and receiving or sending mobile payments at 59% each. In third place, phones are used for social media access (42%). All these features are able with or without internet, as some social media platforms are also connected to USSD, although most people access social media platforms via the internet, which would explain the large difference between the second and third most common activities.

In Kenya, the three main activities are identical, but in a different order. At a record of 83%, most individuals use their phones for mobile money services, which reflects the discussed influence of m-Pesa. Second, Kenyans use mobile phones for social media access, at a high percentage of 82%, followed by text messaging at 78%. Other activities like taking pictures and videos follow at 56%.

Tanzanians mainly use the phones for text messaging at 77%, followed by making and receiving payments at 62% and taking pictures or videos at 59%. Other activities, such as getting information about politics (34%) or accessing social media (28%), follow at a distance.

As the data were collected in 2017 and published in 2018, the number of people searching for health information likely will have increased during the COVID-19 pandemic.

Mobile Phone: Social-Economic Gap Analysis

What the previous statistics do not reveal is the difference in mobile phone ownership in terms of different levels of education, income, age differences and gender—aspects that are considered in the regional projects of DSIK in Eastern Africa. The mentioned groups are often related with each other: people with lower education levels are unlikely to get high-paying jobs, which leads to a lower income. Older adults who have grown up without digital solutions do not have the knowledge on how to use the technology and take advantage of it; thus, they have lower levels of e-Literacy. Women are often disadvantaged in terms of educational opportunities, which leads to lower education and lower paying jobs. Research about the gap allocation for Eastern Africa is lacking. Only for the three countries—Kenya, Tanzania and Uganda—are valid data about the mentioned gaps available; these are discussed in this section. In some cases, no research is available for Uganda. In those cases, only Kenya and Tanzania are discussed.

Education Gap

	Mobile Phone			Smartphone		
	Less educated	More educated	Difference	Less educated	More educated	Difference
Kenya	74%	95%	21	18%	62%	44
Tanzania	72%	90%	18	6%	47%	41

Figure 30: Education gap and phone ownership
(Source: DSIK illustration based on Silver and Johnson 2018 – data collected 2017)

In terms of different levels of education, Figure 30 shows that a higher level of education generally is related to a higher level of phone ownership and thus digital inclusion.

In terms of mobile feature phones, Kenya stands at 95%; nearly every adult with higher education owns a mobile phone, while only 74% of individuals with lower education own one, a difference of 21 percentage points. The gap between lower and higher education is even larger when it comes to smartphone ownership. Less educated individuals are 18% likely to own a smartphone, while more educated adults are 62% likely to own a smartphone—a difference of 46%. In regard to mobile phone ownership, adults with lower education have a decreased likelihood of owning a smartphone (by 56 percentage points), while the likelihood of the more educated is slightly less decreased (33 percentage points).

In Tanzania, the situation of phone ownership is comparable to Kenya, even though the general level of mobile phone ownership is lower. Nevertheless, more educated adults are still more likely to own a phone. In terms of basic/feature phones, less educated adults in Tanzania have a 72% likelihood of owning a phone, while higher educated adults have a 90% likelihood—a difference of 18 percentage points. In regard to smartphone ownership in Tanzania, the gap between lower and higher educated individuals is also substantial. Less educated adults have a 6% likelihood of owning a smartphone,

while more educated people have 47% likelihood—a gap of 41%. Less educated levels have a decreased likelihood of 66 percentage points of owning a smartphone compared to a mobile phone, while higher educated groups have a decreased likelihood of 41 percentage points.

Income Divide

	Mobile Phone			Smartphone		
	Low Income	Higher Income	Difference	Low Income	Higher Income	Difference
Kenya*	79%	86%	7	24%	43%	19
Tanzania*	73%	79%	6	6%	18%	12
Uganda**	no data	no data	no data	3%	6%	3

Figure 31: Income divide and mobile/smartphone ownership
(Source: DSIK illustration based on * Silver and Johnson 2018; **Poushter 2016)

A higher income is associated with a higher standard of living. Therefore, individuals with a higher income are more digitally included and have a higher likelihood of owning a phone, especially a smartphone.

In Kenya, with low incomes are still highly digitally included compared to Tanzania. Adults with low income have a 79% likelihood of owning a standard mobile phone. Higher income is related with an even higher likelihood of 86%, which marks a difference of 7 percentage points. In terms of smartphone ownership, the probabilities are lower. Adults with a low income only have a 24% likelihood of owning a smartphone, which marks a decrease of 55 percentage points compared to mobile phones. In comparison, a higher income level has a 43% likelihood of owning a smartphone which exceeds the probability of 19% points, but also marks a decrease of 43 percentage points compared to the ownership of mobile phones.

In Tanzania, at least every third adult with a low income is digitally included by owning a mobile phone (73%). Compared to Kenya, individuals with a higher income have a slightly higher probability of owning a basic phone at 79%, which leads to a difference of 6 percentage points. In terms of smartphone ownership, only 6% of low-income adults have a likelihood of owning a smartphone, which is a decrease of 67 percentage points compared to a regular mobile phone. In comparison with a higher income level, an increased likelihood of 18% for smartphone ownership was measured, an improvement of 12% points, although still comparatively low. In comparison with mobile phone-owners with higher incomes, smartphone ownership for high income level show a decrease of 61% points.

In Uganda, only data about the likelihood of smartphone ownership in terms of lower and higher income are available. For low-income households, the likelihood is only at 3% for owning a smartphone compared to the higher income level category, which has a likelihood of 6%. This marks an increase of 3 percentage points but is still comparatively low in Kenya and Tanzania.

Age *Difference*

	Smartphone		
	18-29 years	30-49 years	+50 years
Kenya*	41%	27%	10%
Tanzania*	17%	13%	8%
Uganda**	18-34 years	+ 35 years	
	6%	2%	

Figure 32: Age-gap and smartphone ownership
(Source: DSIK illustration based on * Silver and Johnson 2018; **Poushter 2016)

In terms of age difference, the survey only provided information about smartphone ownership. In general, the survey revealed that younger ages have a higher likelihood of owning smartphones; this likelihood decreases with increasing age.

In Kenya, 41% of adults between 18 and 29 years of age are likely to own a smartphone. In the age group of adults between 30 and 49 years, a decreased likelihood of minus 14 percentage points (27%) was found. In the age group of adults above 50 years, only 10% were likely to own a smartphone, marking another decrease of 17 percentage points.

In Tanzania, the likelihood of owning a smartphone is lower than in Kenya. Only 17% of adults between 18 and 29 years have a likelihood of owning smartphone, and in the age group of 30 and 49 years, a decrease of 4 percentage points (13%) was revealed. For the age group of adults above 50 years, only 8% are likely to own a smartphone, another decrease of 5 percentage points.

In Uganda, existing statistics divide just two age groups, but the likelihood of owning a smartphone is even lower than in Kenya and Tanzania. For the age group between 18 and 34 years, the likelihood of owning a smartphone is at 6%; for the age group above 35 years, there is only a likelihood of 2%, a decrease of 4 percentage points.

Gender Gap

For the gender gap analysis, only data for smartphone ownership were available for the three countries Kenya, Tanzania and Uganda. Generally, the analysis revealed a slightly decreased likelihood that women would own any type of phone compared to men. In a worldwide comparison, the inequalities between genders are at a comparable level and following a downward trend.

	Smartphone		
	Women	Men	Difference
Kenya	20%	38%	18
Tanzania	8%	14%	6
Uganda	3%	6%	3

Figure 33: Gender gap and smartphone ownership
(Source: DSIK illustration based on Poushter 2016; data collected 2015)

In Kenya, women have a 20% likelihood of owning a smartphone compared to men, who have likelihood of 38%, marking a difference of 18 percentage points. This marks the highest difference in the available data from Eastern Africa in this context.

In contrast, the overall likelihood in Tanzania for owning a smartphone is comparatively lower than in Kenya; therefore, the difference between women and men is smaller. Women have an 8% likelihood of owning a smartphone compared to men, who have a 14% likelihood, leading to a difference of 6 percentage points.

In Uganda, the general likelihood is again smaller compared to Kenya and Tanzania. Women have likelihood of 3%, while men have a likelihood of 6%, making a difference of 3 percentage points for owning a smartphone.

Internet: User Behaviour

This section discusses user behaviours regarding internet subscriptions, online activities, usage frequency and assessed positive impact.

Internet Subscription

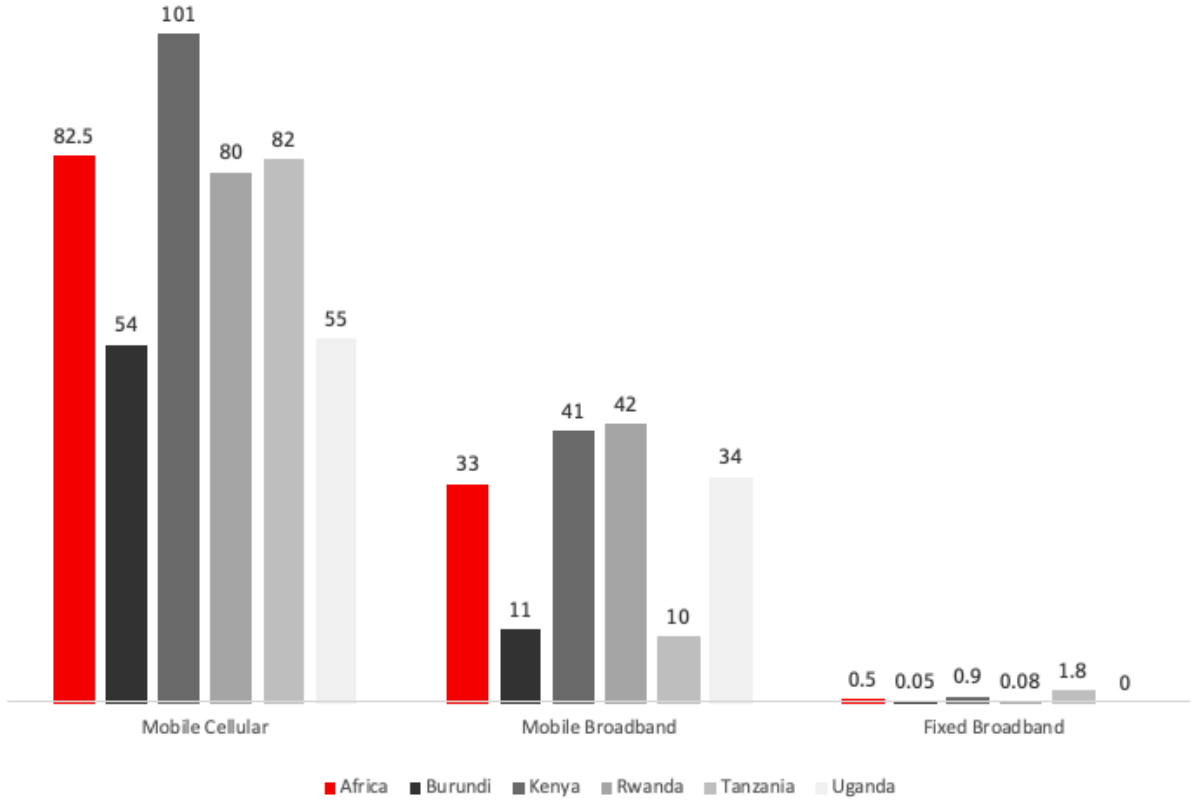

Figure 34: Internet subscriptions per 100 inhabitants
(Source: DSIK illustration based on ITU 2021)

Figure 34 shows the mobile cellular subscription rates per 100 inhabitants. Although a detailed description of the terms “mobile cellular”, “mobile broadband” and “fixed broadband” is not given, “mobile cellular” is likely to include telephony, SMS and slow data transfer standards like Edge or GPRS. “Mobile broadband” includes 3G and LTE standard for mobile handsets that are not limited to a certain location. Consequently, “fixed broadband” describes high-speed internet access at a fixed location (e.g., home or business). Figure 34 shows that mobile cellular is the most popular subscription at 82.5 per 100 inhabitants in Africa, while mobile broadband is only used by every third inhabitant (33). Fixed broadband is noticeably underused in Africa, at an average of 0.5 subscriptions per 100 inhabitants.

In terms of mobile cellular, Kenya holds the record, with 101 subscriptions per 100 inhabitants. It is the only country that is above average, indicating a high use of subscriptions and thus multiple subscriptions per individuals. Similar to the SIM card penetration, the high subscription does not mean that all adults are included. Kenya is followed by Tanzania at 82 subscriptions and Rwanda at 80 subscriptions, which, although lower, are still within the African average. Burundi (54) and Uganda (55) have the lowest use of regular mobile cellular subscriptions, well below the African average.

Fixed broadbands are unlikely to be utilised in all five project countries. Tanzania holds the record at 1.8 inhabitants per 100 inhabitants. Kenya (0.9), Rwanda (0.08), Burundi (0.05) and Uganda (< 0.05) are even below one inhabitant. Only Tanzania and Kenya are above the African average. The numbers of fixed broadband enhances the findings regarding mobile markets and is expected, as desktop computers and laptops, which are mainly used at home, are not as common (as previously discussed). In conclusion, a focus on mobile phone solutions in development cooperation will have a greater impact.

Online Activities

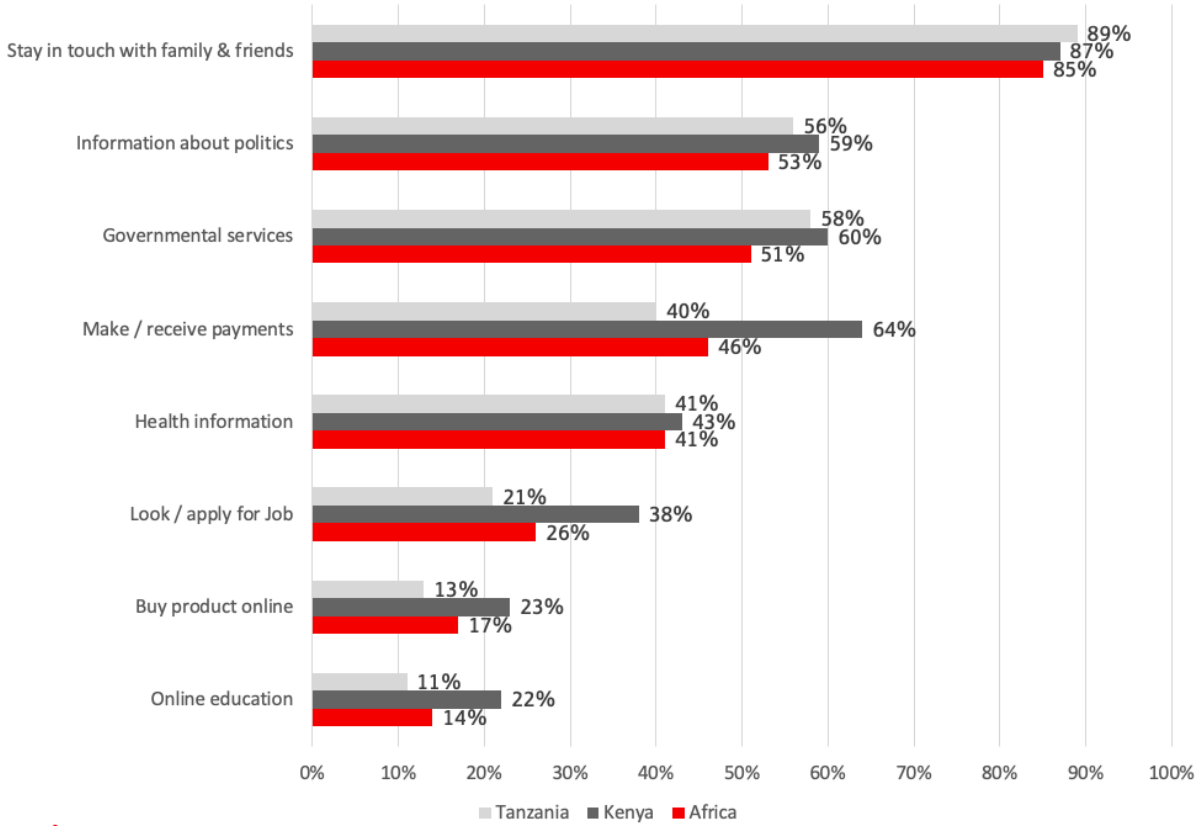

Figure 35: Online activities: use cases of internet
(Source: DSIK illustration based on Silver and Johnson 2018 – data collected 2017)

Figure 35 shows the most favoured activities for which the internet is used in Africa and in Kenya and Tanzania specifically.

The most favoured use of internet connection in Africa is to stay in touch with family and friends (85%), followed by accessing information about politics (53%) and governmental services (51%). Making and receiving payments is the fourth most common activity (46%). Accessing health information (41%) may have increased during the COVID-19 pandemic, as the data were collected in 2017. Use cases, such as looking or applying for a job (26%), e-commerce (17%) and especially online education (14%), are comparatively low.

In Kenya, 87% of users utilise internet connection to stay in touch with friends and family, which is close to the African average of 85%. This activity is followed by making and receiving payments at 64%, which is 18 percentage points above the average at 46%, thus reflecting the importance and

influence of m-Pesa. Third, governmental services represent 60%, thus lying slightly above the African average at 51%. Health information (43%) is relatively low but may have increased during the COVID-19 pandemic. Kenya lies above the African average of 24% for looking/applying for a job (38%) but is still relatively low. E-commerce is at 23%, also slightly higher than the average of 17%, and online education at a rate of 22% is also higher than the African average of 14%, but still comparatively low.

In Tanzania, staying in touch with friends and family is also the main activity for users (89%), lying slightly above the African average (85%) and that of Kenya (87%). Second, internet access is used for governmental services (58%), above the African average of 51%. Third, the internet is used for information about politics at 56%, which is slightly above the African average of 53%. Health information at 41% is also comparable to Kenya (43%) and is the same as the African average (41%); however, this may have increased during the COVID-19 pandemic. Making and receiving payments are comparatively low at 40%, marking a difference of 24 percentage points from Kenya (64%) and 6 percentage points below the African average (46%). Other usages—looking or applying for a job (21%), e-commerce (13%) and online education (11%)—mark the three lowest usage cases for online activities. Online education is especially low in Africa and East Africa.

These results impact development cooperation, as they show that socialising activities are still the most favoured activity. This reflects the way users utilise their internet connection and provides insights on how to reach the population. The figure also reveals that financial inclusion is not reaching the entire population. Immense potential lies in online education, as it allows a wider audience to be reached in the most cost-effective way. However, this opportunity has not yet been deeply established in existing education paths for broader parts of the population and thus is not yet part of the learning culture in many African countries. Therefore, development cooperation should support and promote the use of online educational platforms to reach as many end-beneficiaries as possible.

Frequency of Internet Usage

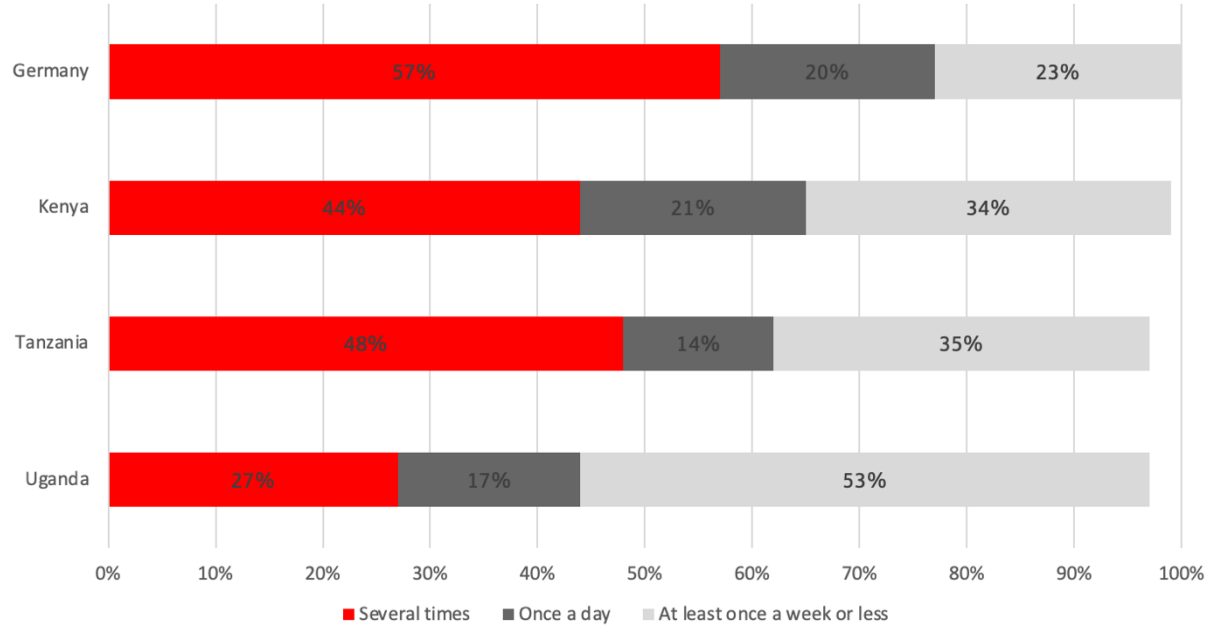

Figure 36: Frequency of internet usage
(Source: DSIK illustration based on Poushter 2016; data collected 2015)

The figure above shows the frequency of internet usage in Germany as a representative of the Global North compared to that of Kenya, Tanzania and Uganda. In Germany, 20% use the internet at least once a day, and 57% use the internet more often. Thus, 77% use the internet daily, while only 23% use the internet once a week or less.

In Kenya, fewer people use the internet several times a day (44%), and 21% use the internet at least once a day. This leads to a cumulative percentage of 65% using the internet daily, which marks a difference of only 12 percentage points compared to the Global North. However, more than one out of three (34%) are using the internet once a week or less.

In Tanzania, slightly more people use the internet several times a day (48%), and only 14% use the internet at least once a day. However, a cumulative 62% use the internet daily, which is slightly below the Kenyan user behaviour (65%). Furthermore, 35% use the internet once a week or less.

In Uganda, only 27% use the internet several times a day, which marks the lowest frequency in East Africa. An additional 17% use it at least once a day. Furthermore, 53% use the internet once a week or less, which marks the lowest record in East Africa.[1]

The lower frequency of internet usage must be inferred, as the reasons were not examined in the research. One of the main reasons could be the affordability of internet bundles, specifically 3G and LTE, as affording these bundles is still challenging for broader parts of the population. Consequently, the frequency of internet usage of marginalised groups is lower. Another reason might be the lack of technical devices, especially when phones are shared within families or households. Furthermore, lack of appropriate content and a low e-Literacy level might lead to a low frequency of internet usage. These aspects must be examined further to ensure that digital activities in development

[1] Only in comparison between countries, for which data is available

cooperation reach the end-beneficiaries. It is not only important to understand for what and how often the internet is used but also why the internet is not used, as these aspects must be addressed to increase the benefits and enable end-beneficiaries to participate fully in digitalisation.

Assessment of the Impact of Internet Usage

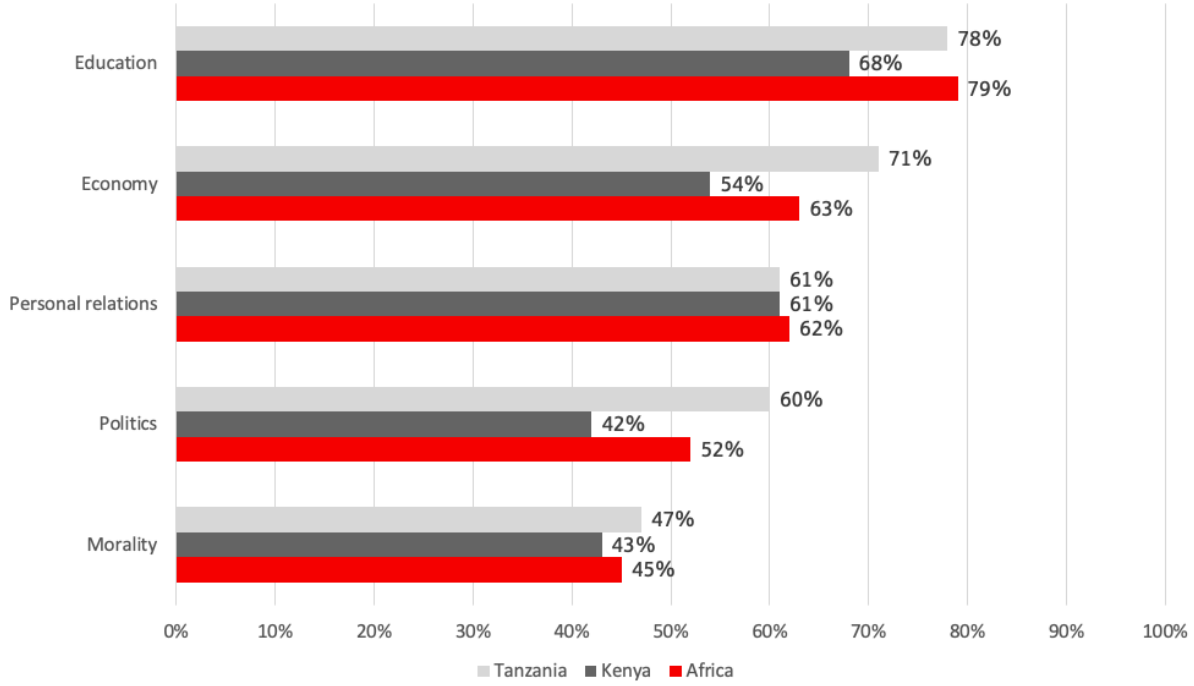

Figure 37: Associated impact of the internet
(Source: DSIK illustration based on Silver and Johnson 2018; data collected 2017)

The figure above shows the individuals in Africa in general and in Kenya and Tanzania specifically who relate with the internet in terms of education, economy, personal relations, politics and morality.

In Africa, 79% of the participants believe that the internet positively impacts education, followed by the economy, which is assumed to have positive impact by 63%. Third, participants believe that the internet positively impacts personal relations, which is expected considering the usage of internet and mobile devices for socialising aspects. Only 52% still acknowledge a positive impact on politics, and only 45% acknowledge positive impacts in terms of morality, which is comparatively low in regard to the assumed impact on education, for example. The greatest distribution between individual countries was measured for morality. In Nigeria, for example, 57% perceive a positive impact of the internet on morality, while in Senegal, only 27% believe this is the case.

In Kenya, 68% perceive a good impact of internet usage on education, a decrease of 11 percentage points from the African average and the lowest measured assessment in Eastern Africa. A little above half (61%) perceive a positive impact of internet usage on personal relations, while only a little over every second individual (54%) acknowledges a positive impact for the economy. The rates for morality and politics are even lower, at 43% and 42%, respectively. Considering that the previous statistics about phone ownership indicated, that Kenyans especially are highly digitally included in comparison to other countries in Eastern Africa, this critical assessment is unexpected. As the data

were collected before COVID-19, the assessment of the impact of internet usage may have changed in 2021.

The positive impact of the internet on education was perceived by 78% of Tanzanians, which is comparable to the African average. The positive impact on the economy was perceived by 71%, which is 8 percentage points above the African average and 17 percentage points above the Kenyan assessment. This may be because more than half of Tanzanian internet users utilise the internet to access information about politics. This is not equal to the category economy but might be part of political discussions and does influence the way Tanzanians view their economy. The positive impact of personal relations is assumed by 61%. At an East African record, 60% are convinced about the positive impact in terms of politics, which is compatible with the internet usage for getting news about politics. With this assessment, Tanzania lies 8 percentage points above the African average and 18 percentage points above Kenya. In terms of morality, less than every second person (47%) perceives a positive impact of the internet, which is comparable to the African average and to Kenya.

The figure 37 shows that better access to the internet does not lead to a better assessment of the positive impact of the internet. Instead, it seems to lead to a more critical view of the influence and impact of internet connection in terms of important aspects like education, economy, personal relations, politics and morality. However, the data were collected before the COVID-19 pandemic. The importance of internet connection and its impact on the economy and social life were highlighted during the lockdowns, when offices and shops were closed, and more individuals became dependent on information via the internet.

Internet: Socio-Economic Gap Analysis

Similar to the specific use of mobile devices, the previous statistics did not provide information on internet usage in terms of different levels of education, income, ages and genders, aspects that are considered in the regional projects of DSIK in Eastern Africa. However, no data about this allocation are available specifically for Eastern Africa. Therefore, no data are available for all five project countries; in such cases, only the available data will be discussed. In the statistics of PEW Research Center adults with internet access or smartphone ownership were considered.

Education Gap

	Internet Access		
	Less educated	More educated	Difference
Kenya	25%	74%	49
Tanzania	16%	66%	50

Figure 38: Education gap and internet access
(Source: DSIK illustration based on Silver and Johnson 2018 – data collected 2017)

Generally, the statistics revealed that individuals with higher education have a higher likelihood of having internet access. This matches the data discussed earlier about mobile phone ownership and education.

In Kenya, only every fourth adult with lower education has internet access, a low number in comparison to higher education levels, where nearly three-quarters (74%) have internet access, leading to a difference of 49 percentage points.

The access level of Tanzania is generally lower than that of Kenya. Only 16% of less-educated adults have internet access, while 66% of higher educated adults have internet access, a difference of 50 percentage points. In contrast to Kenya, less-educated individuals have a decreased internet access of 9 percentage points and more-educated people of 8 percentage points. This supports the discussed statistics in this chapter about the increased digital inclusion.

Income Divide

	Internet Access		
	Low Income	Higher Income	Difference
Kenya	26%	52%	26
Tanzania	13%	27%	14
Uganda	7%	17%	10

Figure 39: Income divide and internet access
(Source: DSIK illustration based on Poushter 2016; data collected 2015)

In terms of income differences, the statistics revealed that individuals with a higher income level have a higher likelihood of internet access compared to those with lower income levels. In a comparison of the three Eastern African countries, Kenyans have a higher likelihood of internet access, regardless of income.

In Kenya, only 26% of lower-income groups have internet access, while higher-income groups have a likelihood of 52%, a difference of 26 percentage points. Compared to other countries in Eastern Africa, this marks the highest likelihood for lower income levels as well as higher income levels for internet access.

In Tanzania, 13% of individuals with a lower income level have internet access, a difference of 14 percentage points compared to individuals with a higher income level at 27%. In comparison to Kenya, Tanzanians have a decreased likelihood of 13% for lower income levels and 25 percentage points for higher income earners.

The lowest internet access for lower income groups is measured in Uganda at 7% and for higher income groups at 17%. The difference between lower and higher income groups is 10 percentage points, which is the lowest. Therefore, the likelihood of both groups is the smallest, but the general access differs highly, especially compared to Kenya.

Age Difference

	Internet Access		
	18-29 years	30-49 years	+50 years
Kenya*	52%	36%	14%
Tanzania*	34%	21%	15%
Uganda**	18-34 years	+ 35 years	
	16%	3%	

Figure 40: Age difference and internet access
(Source: DSIK illustration based on *Silver and Johnson 2018; ** Poushter 2016)

Age is an important factor for internet access. The research revealed that younger people have internet access more often compared than older adults. The divide in Kenya is the greatest, but also marks the highest numbers in the region, while Tanzania has the lowest divide, but also the lower access rate, along with Uganda.

In Kenya, the younger generation (between 18 and 29 years of age) has a likelihood of 52%, which is a decrease of 16 percentage points compared to adults between 30 and 49 years (36%). In this age group, only a little above one-third have internet access, while every second individual between 18 and 29 years has internet access. For adults above 50, only a 14% likelihood remains, marking another decrease of 22 percentage points.

In Tanzania, only every third (34%) of adults between 18 and 29 years have internet access, while only 21% of adults between 30 and 49 years have internet access, marking a decrease of 13 percentage points. Adults over 50 have a 15% likelihood, which is comparable to Kenya, although the difference of the younger generation (between 18 and 29 years of age) is smaller and stands at 19% compared to 38% in Kenya. However, Kenya has higher numbers in terms of internet access in general.

The age groups in Uganda are differently classified, yet the likelihood of internet access by younger generations is substantially higher compared to older generations. Of adults between 18 and 34 years of age, 16% have internet access, while only 3% of adults over 35 have internet access, a difference of 13 percentage points. Compared to Tanzania, less than half of the younger generation has internet access, and compared to Kenya, the likelihood is even less than one third.

Gender Gap

	Internet Access		
	Women	Men	Difference
Kenya	39%	49%	10
Tanzania	15%	28%	13
Uganda	6%	16%	10

Figure 41: Gender gap and internet access
(Source: DSIK illustration based on Poushter 2016; data collected 2015)

In terms of gender, the PEW Research Center (2016) found that women are disadvantaged not only in terms of mobile phone ownership but also in internet access. This fact is valid for countries not only in Eastern Africa but also worldwide, including industrialised countries in the Global North. In Germany, for example, 80% of women have internet access, compared to 89% of men, marking a difference of nine percentage points, a gap that is comparable to that of countries in Eastern Africa. However, the gender gap is closing, while awareness is rising.

In Kenya, 39% of the women and 49% of men have access to the internet, regardless of education, income or age. This is the highest percentage for each gender in Eastern Africa.

In Tanzania, the rate is generally lower for both genders. Women have 15% internet access, while men have 28%, a difference of 13 percentage points, which represents the largest gender gap in East Africa. Compared to Kenya, women have lower internet access by more than half, while men still have slightly less than half.

Women and men in Uganda have the lowest percentage of internet access in East Africa. Only 6% of women and 16% of men have access to the internet, a difference of 10 percentage points. The gap is similar to that of Kenya or Germany, but overall access is more than six times lower for women and more than half as low for men.

Rural-Urban Divide
Data about a rural-urban divide are lacking. According to ITU (2021), only 6.3% of the rural population has internet access compared to 28% of the urban population, a difference of over 22 percentage points. A large proportion of the poor and marginalized population live in rural areas and are often the focus of development cooperation projects.

The statistics discussed in this section include adults with internet access or who own a smartphone. Although ownership of smartphones leads to the assumption of internet access, this may not be the case. As discussed before, availability is not the only factor for internet connection. Affordability in particular, as well as e-Literacy and specific content, is equally important. The actual percentages of internet access might be lower, even though a relation between smartphone ownership and internet access is conceivable and likely.

3.7 Digital Sustainability

Sustainability is a key element in the SDGs of the UN; therefore, it influences every activity in development cooperation (United Nations w. Y.), particularly considering (1) digitalisation's increasing impact on economic and social development in Africa, (2) the discussed chances of leapfrogging development steps and enhancing quality of life and (3) the challenges and threats of the digital divide. Furthermore, digitalisation can be resource intensive, which can lead to additional strain on already scarce resources in Africa (GIZ w. Y.).

The sustainability framework unites the three perspectives of economic, ecological and social sustainability; these aspects can also be found in the SDGs (Schulz 2020). In this section, the different

components of these three perspectives are analysed in regard to digitalisation. Each digital solution brings its own sustainable profile; however, general and common trends can be identified for each perspective.

Economic Sustainability

Digitalisation has affected every sector of the economy and has triggered far-reaching structural changes towards a digital economy. The pandemic has reaffirmed and accelerated this direction worldwide. Xiaozhun Yi, Deputy Director General of World Trade Organization (WTO), stated, "The lessons we are learning underscore the benefit/importance of greater international cooperation to facilitate the cross-border movement of goods and services, narrow the digital divide, and level the playing field for micro, small and medium-sized enterprises (MSMEs)—in short, for our efforts to achieve the SDGs in this decade" (UNCTAD 2020). Thus, the concept of economic sustainability is directly connected with SDGs, including the following:

- SDG 4 Quality Education,
- SDG 8 Decent Work and Economic Growth,
- SDG 9 Industry, Innovation and Infrastructure,
- SDG 12 Responsible Consumption and Production,
- SDG 16 Peace Justice and Strong Institutions and
- SDG 17 Partnerships.

The SDGs can be achieved through promotion of sustainable, goal-oriented and needs-based investments in technology, with focus on secure jobs, future-proof and resilient business models, a scalable IT landscape, as well as a stable political system and a strong regulatory authority.

The opportunities, benefits and potential of digitalisation in Africa have already been analysed in detail in the earlier section on the → Relevance of Digitalisation in Africa. Therefore, the above list is a summary of the most important aspects, not a full analytical discussion.

Ecological Sustainability

The Global Waste Monitor (2020) from UN, the ITU and other institutions stated that around 53.6 million tonnes of electric waste were generated worldwide in 2019, representing an increase of 21% in the last five years. Only 17.4% of this waste was recycled, which highlights the burden of digital transformation on the environment. An e-waste of 74 million tonnes is projected for 2030 due to higher consumption of technical devices, shorter product life cycles and fewer options for repair (Forti, Baldé, Kuehr and Bel 2020).

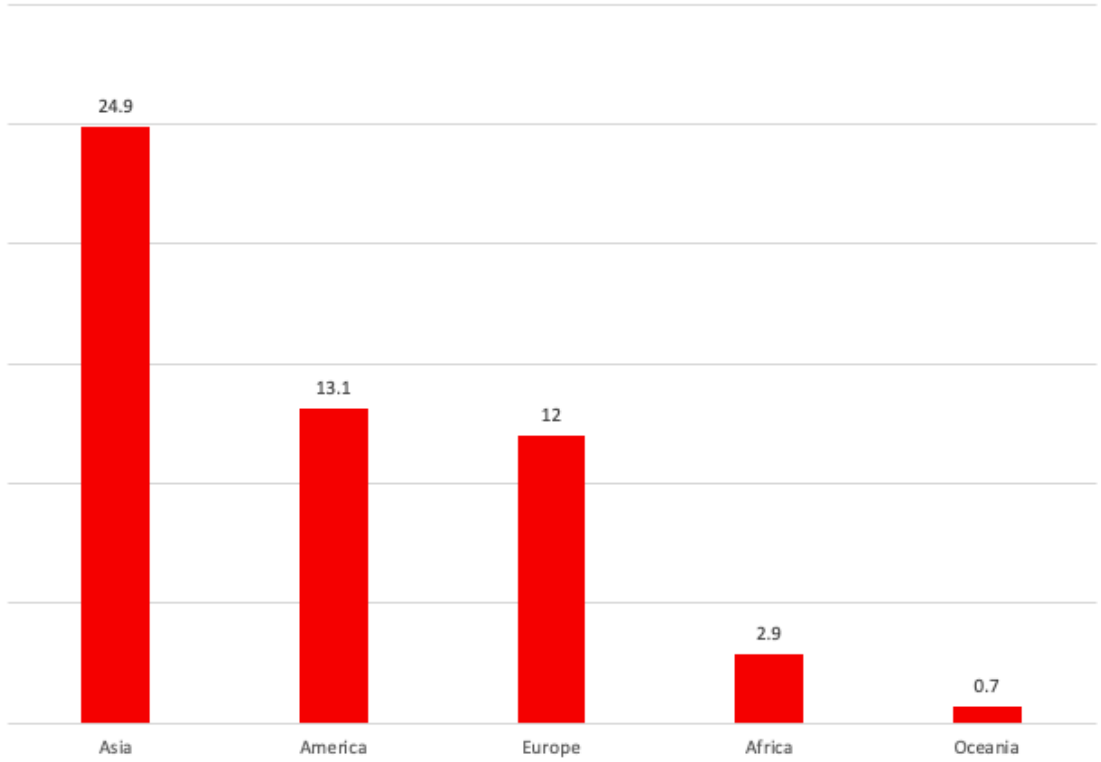

Figure 42: e-Waste distribution worldwide (in million tons) in 2019
(Source: DSIK illustration based on e-Waste Monitor by Forti, Baldé, Kuehr and Bel 2020)

Figure 42 illustrates the distribution of e-waste worldwide. Asia leads the distribution, with 24.9 million tons, followed by America and Europe, with 13.1 and 12 million tons, respectively. Africa generates 2.9 million tons, while Oceania generates 0.7 million tons (Forti, Baldé, Kuehr and Bel 2020). However, these numbers must be evaluated considering the size of the population on the continents.

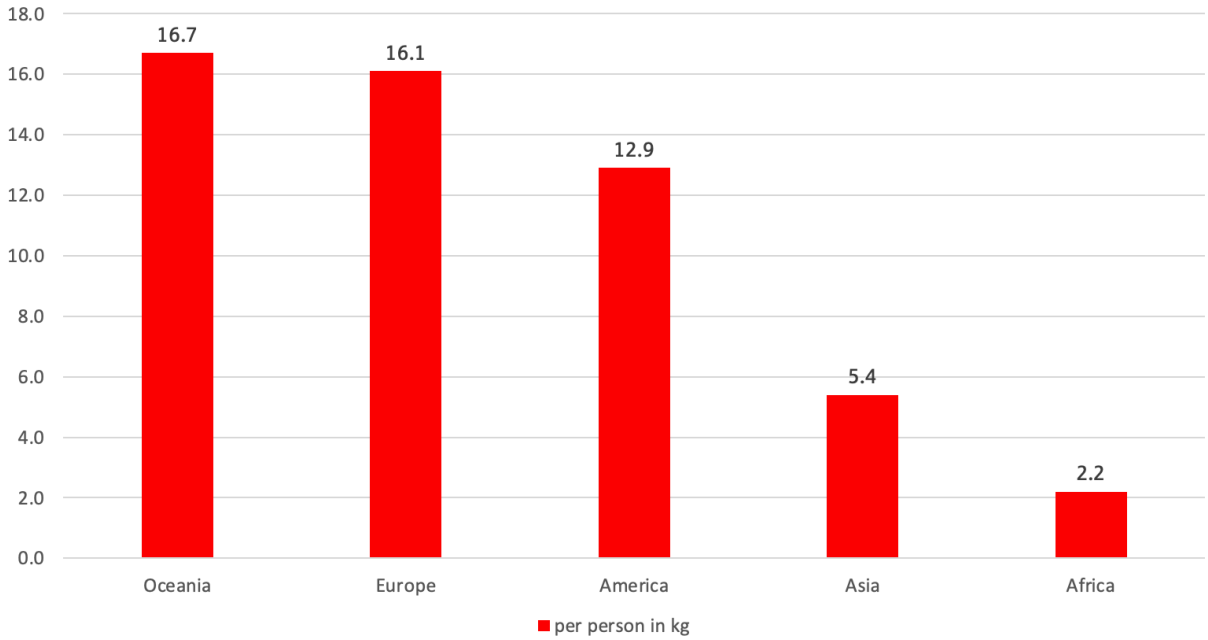

Figure 43: e-Waste distribution per capita in kilogram
(Source: DSIK illustration based on e-Waste Monitor by Forti, Baldé, Kuehr and Bel 2020; population in 2019 according to Worldometer,w. Y.)

Considering the population on these continents, the e-waste per person was highest in Oceania (population 42 million) in 2019 at 16.7 kg per capita, followed by Europe (population 747 million) with 16.1 kg. Third, America (population 1,015 million) had 12.9 kg e-waste per capita in 2019. The two most populous continents, Asia (population 4,600 million) and Africa (population 1,308 million) had the least e-waste per capita, at 5.5 kg and 2.2 kg, respectively.

Per capita numbers can be expected to increase further with positive economic development and a general improvement in living standards in continents like Africa. Another factor for e-waste development is population growth, as the population in Africa is exponentially growing. A birth rate of 2.1 children per woman is necessary to keep the population stable worldwide. Industrialised countries have been below this reference for many years; Germany, for example, is well below the line at 1.57, while South Korea is at the lowest with 1.11 births per woman. Currently, 1.4 billion people live on the African continent, representing 14% of the global population. The United Nations estimated that up to 2.6 million people will live on the African continent by 2050, accounting for 22% of the world's population. In East Africa, Tanzania has the highest birth rate. The impact of such high fertility is even greater given the already comparatively large population (59.73 million inhabitants). Moreover, fertility is comparatively high in former civil war countries, for example, in Burundi with 5.2. Tanzania and Uganda follow at 4.8 and 4.7. Countries such as Kenya at 3.4 or Rwanda 3.9 have a fertility in the middle range, which is due to favourable economic development. The reasons for this finding were not examined in the UN report (Franke 2020, World Bank w. Y. a).

Forti, Baldé, Kuehr and Bel (2020) described the burden for the environment as well as the negative impact on human health and well-being in their Global E-waste Monitor 2020. The report shows the threats for the achievement of many SDGs, including the following:

- SDG 3 Good Health and Well-Being,
- SDG 8 Decent Work and Economic Growth,
- SDG 6 Clean Waste and Sanitation and
- SDG 14 Life below Water.

The demand for raw materials to produce electricity and electronic equipment (EEE) is furthermore highly related to SDG 8, Goal 8.4.1 on material footprint and 8.4.2 on domestic material consumption (Forti, Baldé, Kuehr and Bel 2020).

Social Sustainability

Social sustainability aims to achieve a decent life for everybody through the distribution of social burdens, the distribution of roles, the distribution of work, the fight against unemployment and the distribution of equal opportunities (DSIK w. Y.). It is directly related to many SDGs, including the following:

- SDG 1 No Poverty;
- SDG 2 Zero Hunger;
- SDG 3 Good Health and Well-Being;
- SDG 4 Quality Education;
- SDG 5 Gender Equality;
- SDG 8 Decent Work and Economic Growth;
- SDG 10 Reduced Inequalities;

- SDG 11 Sustainable Cities and Communities;
- SDG 12 Responsible Consumption and Production; and
- SDG 16 Peace, Justice and Strong Institutions.

The above-mentioned SDGs reveal how social sustainability can be achieved: through sustainable access to quality education, sustainable and future-oriented economic concepts, empowerment of minorities, gender equality and a strong political and legal system that braces the country's economy and society. In Africa, all these areas are directly or indirectly affected by digital transformation and digital trends. For example, digital technology can offer unique solutions for simpler access to education not only for the urban population but also for groups with a higher risk of structural exclusion: those living in rural areas, women, minorities, disabled people, people of higher age and those with lower incomes.
Furthermore, digital technologies can offer access to new business sectors and create new business models that foster employment and higher income for the mentioned groups; this shows that digitalisation must be considered from the perspective of sustainability (Neumann 2020).

4 Theoretical Research Implications

The previous chapters provided detailed insights into digitalisation in Africa, its impacts and hurdles, as well as unique market characteristics that have indirect consequences for the regional projects of DSIK in Eastern Africa.

The regional projects in Eastern Africa are implemented to professionalise and economically strengthen MFIs/SACCOs and to support financial inclusion of the population and end-beneficiaries. In this context, digitalisation can foster and accelerate financial inclusion as it enables MFIs/SACCOs to reach a wider target group and offer modern simple solutions. Digitalisation not only enables but also increases the amount of governance towards digitalisation and supervisory requirements. The innovative force of non-financial organisations like MNOs enhances the competitive pressure on MFIs/SACCOs. Additionally, the current digitalisation in the financial sector is mainly characterised by non-industry players, such as MNOs and start-ups, which reach a broad portion of the population via simple and effective low-tech solutions and represent increasing competition to MFIs/SACCOs. Without digitalisation, it will become increasingly difficult for MFIs/SACCOs to fulfil their social mandate. In this context, digitalisation and finance must be considered as enablers for everyday occurrences like paying bills, shopping for groceries and receiving education. The overall purpose must always be considered so that digital financial solutions fit people's needs. To enhance financial inclusion through digital solutions, all economic sectors must be linked to and work with the financial sector.

Digitalisation is not a single process that digitises analogue data and processes one to one (digitisation); instead, it is a complex process that fundamentally changes ways of working and significantly transforms all areas of life and the economy, both privately and professionally. MFIs and SACCOs are still in the early stages of this development. Nevertheless, digitalisation will have a significant impact on the business models of MFIs/SACCOs, particularly on the nature of customer relations and the closely related use of digital technologies (Drews and Schmidt 2016). According to the Business Model Canvas (BMC), the following effects are to be expected regarding business models:

- Key Partners: Increased partnerships with MNOs or other digital leaders that might not originate from the financial sector but are now dominating the landscape of innovations.
- Key Activities: A broader landscape of products; the way services and products are delivered to the customer will have more digital components.
- Key Resources: More staff with advanced IT skills will be necessary to foster the promotion of the new products and service range.
- Value Prepositions: The main value delivered to customers is not just financial inclusion but also efficiency in delivering financial services. Products like savings and insurance will foster the financial health of customers and members. Interoperability of MFIs/SACCOs both regionally and at a national level will especially foster a more transparent and safer way to transfer money.
- Customer Relations: Customer relations will be completely changed. More products and services will be delivered online, highly influencing the way MFIs/SACCOs communicate with their customers. Websites and online advertisement will decide about the first impression of a company and a product/service resulting in high demand for more products/services.

- Channels: As mentioned, digital delivery channels will be increased and diversified, especially in the areas of mobile money transfer, online banking, social media and so on.
- Customer Segments: The focus of MFIs/SACCOs will remain on the poor and marginalised portions of the population; thus, customers/members will be more diverse.
- Costs: The investments costs will be high, especially at the beginning. Cost effects will be visible only over the mid- or long-term.
- Revenue Streams: New revenue streams coming from new products and delivery channels will be accessed. Due to a wider audience, the revenue will increase, and an increase in profit will follow when cost-effects occur.

In contrast, digitalisation has a disruptive potential, which can lead to an even bigger divide and social injustices among people with different educational levels, income groups, ages, genders or residential areas (rural/urban). Digital activities must focus and be based on value principles that need to be well defined. Doing so will empower and educate both institutions and individuals, instead of excluding them. Digitalisation will then boost economy growth and strengthen institutions rather than creating job loss, making everyday life easier instead of focussing on KPIs about efficiency. It will support sustainability, instead of creating a throwaway culture that strains the limited resources of individuals and organisations. Finally, digitalisation in Africa must focus on fairness and affordable solutions.

Moreover, hurdles to digitalisation, such as availability, affordability, ability and appetite of technical solutions, affect financial inclusion. In this context, sustainability aspects must be considered, as managing these hurdles is already difficult. Thus, solutions should persist long-term. For the projects of DSIK in Eastern Africa, this implies that sustainability aspects must be considered for every project activity and business case and should be considered in the digital value principles.

To enhance economic sustainability, scalable, open-source and future-oriented technologies shall be used. They must fit into the existing IT landscape and the needs of the user. Innovative technological concepts like shared IT services or cloud computing reduce the cost of investments and maintenance. In addition, efficient processes that match the culture and population help reduce costs and resource efforts. Sustainable investments and a future-oriented, resilient business model led to greater professionalism, stronger institutions and job creation.

In terms of ecological sustainability, solutions that create less e-waste or are recycled foster the support of resources and the environment. Green energy solutions like solar power also reduce the impact on the environment. Another important factor is service hours of digital solutions. Servers or computers do not necessarily need to run 24/7 and limiting their hours would reduce the cost and consumption of electricity.

The social sustainability of digital solutions lies in the social benefits and thus in the effective direction of a digital solution. Technology must be used and implemented in a way that decreases social burdens and inequalities in education or gender gaps, age or income differences as well as geographic (rural/ urban) aspects. This can be achieved through developing digital solutions that are usable even for marginalised groups, less-educated individuals and people with a lower income. Low-tech solutions are especially suitable for reaching a wider audience within the mentioned groups. For example, voice systems would financially include people with disabilities or low literacy levels. These

solutions already exist and just need to be adjusted for market fit. Additional IT trainings would help include people of older age, who grew up before technology was a day-to-day companion, as well as groups with less education. Additionally, social sustainability could be accelerated through economic and ecological sustainability. Sustainable investments and future-oriented, resilient business models lead to job creation, which transforms and improves people's lives.

Summarising the aspects to be considered by DSIK in Eastern Africa, there should be more focus on individuals of lower education, low income, older age and female gender, as well as those living in rural areas. These are the most disadvantaged and marginalised demographics. To foster financial inclusion, prepare African societies for the future and reach the impact and desired achievement of the SDGs, these population groups must not be left behind in the digital transformation. Therefore, low-tech and mobile solutions will have the biggest impact for MFIs/SACCOs and end-beneficiaries in terms of the afore-mentioned focus groups. Moreover, educational offers, especially for lower educated individuals and women, are necessary to continue narrowing the gender and educational gaps. Since the research and available data on the Sub-Saharan region are limited, as reaching these people and financing broader studies are difficult, a continuous internal M&E framework, as well as the support and promotion of further research, will be important, as needs will continuously change over time. More data are needed to foster the understanding of these changes as well as customer behaviours, as projects that fit into these needs and elucidate issues for potential investors must be implemented.

The surveys conducted by DSIK in Eastern Africa, which are summarised in chapter five, will elucidate the needs of the partners of DSIK in Eastern Africa and their associated members and improve the understanding of institutions' digital readiness. Thus, these surveys are not a validation of the existing research, but a supplement aimed at closing the gap between the research implications and current trends in project reality. The survey will help specify the direction of the project portfolio for the main project phase beginning 1 October 2021 and provide implications for future project activities in which the trends and research implications will be implemented. For the measure of digital readiness, a digital readiness framework suiting the project reality will be described in the next section. In terms of expected results, availability is not the only or even the main challenge. The issues are much more complex, beginning with literacy in general and e-Literacy specifically (among others). The affordability of digital solutions is likely one of the biggest hurdles, along with e-Literacy.

Part II – Primary Research – Digital Surveys EA

The second part of this working paper focusses on explorative research. To gain deeper insights into digital readiness in the project-related environment, DSIK conducted surveys in the region.

5 Digital Surveys

The desk research provided a fundamental understanding of the state of digitalisation in Africa. The next step is to analyse the project environment and digital readiness at the MFI/SACCO level, as this is the interface between the associations and DSIK as consultants and the end-beneficiaries. Strengthening end-beneficiaries in regard to their importance in the society and financial inclusion is the main goal. Furthermore, the digital readiness of DSIK in Eastern Africa partners is well known due to the close collaboration and due diligence during the project agreement phase.

Based on the previous explanations, the survey focussed mostly on topics of the second regional project regarding rural development. One reason for this was greater specification on digital transformation of MFIs/SACCOs, which is related with a higher complexity and uncertainty. The analysis of digital readiness shall provide reference points for future activities and their focus. Furthermore, the set of activities in the first regional project regarding vocational and commercial education is comparatively well defined with fewer unknown elements. Nevertheless, the knowledge aspect will be covered briefly.

The survey was conducted in all five project countries, considering country-specific project characteristics and individual activity portfolio.

5.1 Digital Readiness Framework DSIK in Eastern Africa

Digital readiness is measured through a unique framework that analyses different perspectives of digital readiness. However, the existing predefined digital readiness frameworks are too unspecific for the market and unsuitable for the environment of the regional project. In consequence, DSIK in Eastern Africa has developed its own framework with four different elements that have a strong focus on project reality. This framework was used as a basis for the survey to establish comparability in the region.

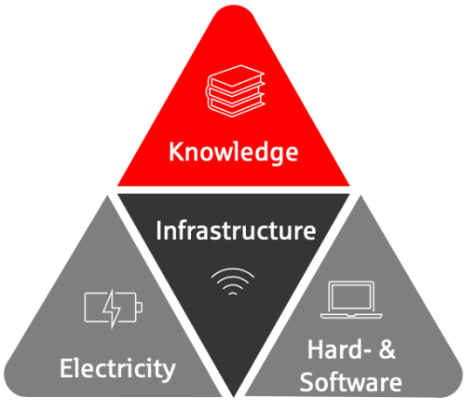

Figure 44: Digital readiness framework of DSIK in Eastern Africa
(Source: DSIK illustration)

Based on the existing project experience of DSIK in Eastern Africa in the East African region, the digital transformation of MFIs/SACCOs is expected at an early stage. Therefore, the framework focusses on the following fundamental aspects of digitalisation:

- Electricity,
- Hard- and software,
- Infrastructure and
- Knowledge.

The dimension of *electricity* describes the access to and stability of power, as well as possible back-up solutions through solar panels or generators. A functioning power supply is crucial for digitalisation, as technologies—even those that can run temporarily without power through batteries—depend on electricity to operate. Important minimum components for digitalisation are *hardware* equipment for MFIs/SACCOs. This mainly includes desktop computers and laptops; however, mobile phones, printers, unique power supply equipment and servers may be also necessary. In terms of *software* products, a core banking system is of particular importance to banking businesses, representing the first step in the digitisation of MFIs/SACCOs. This software does not have to include large applications but should have a certain level of professionalism and fulfil security aspects that cannot be achieved with simple MS Excel solutions. Basic software solutions like MS Office and basic core banking systems are still stand-alone solutions that must be connected to certain *networks* to achieve the next level of potential benefits. Connections to payment switches, mobile money or e-wallets allow interoperability between different MFIs/SACCOs and different payment systems, thus advancing financial inclusion in terms of payment transactions for the population. Networks are often related with internet connection as many services are offered as a shared IT service. *Knowledge* is a companion to the entire process of digitalisation, as it is necessary in each step of the framework. It includes the knowledge of apex organisations, MFIs/SACCOs and the population that requires basic e-Literacy to interact with the technical solutions. All four dimensions go hand-in-hand and should not be misunderstood as a hierarchy. Some dimensions, like software or a network, cannot be set up without basic hardware components, but issues in power supply can be bridged with back-up solutions while knowledge and education are enthroned above all dimensions.

The framework can also be understood as a reference baseline for a minimum digital standard for further activities like digital product development.

5.2 Methodology

The explorative research of this paper is based on a survey with a semi-standardized questionnaire as methodology. Through standardisation, this format allows a certain comparability of the country-specific surveys and simplifies the evaluation of a large number of MFIs/SACCOs to be surveyed. Additionally, the surveys were conducted during the COVID-19 crisis, which complicated the field work due to recurring lockdowns and existing travel restrictions. The field team of DSIK in Eastern Africa was reduced at the time of data collection, and appointments were limited to a few workshops. Therefore, it was not possible to visit the MFIs/SACCOs as originally planned. Instead, the few existing appointments with the on-site team were used for data collection. Other aspects of data collection were conducted online.

Data collection occurred from January 2020 to January 2021. The questionnaires were semi-structured, mainly with standardised answer possibilities and a few free-text fields to add specific needs and perceptions about the strategic business operations. Each questionnaire covered the dimensions of the DSIK in Eastern Africa digital readiness framework (i.e., electricity, hardware, software, network and knowledge), but they differed in the content and characteristics of the questions as well as in the number of questions on a particular dimension. Each questionnaire contained around 20 questions. The different questionnaires per country can be found in the country reports.

Most of the collected data was physical, as the questionnaires needed to be printed. Thus, the data had to be digitised before evaluation could begin. In this step, data cleaning was performed. Questionnaires that were not filled out completely, had redundancies and or revealed logical issues were highlighted and evaluated in more detail. Data sets that were incomplete to a large and critical extent or allowed ambiguous interpretations were eliminated from further evaluations and statistical considerations. In some cases, incomplete forms were included, but only valid answers were considered in the statistical evaluation. This led to staggered sample sizes between questions. In this process, certain patterns provided evidence of pervasive data quality issues. Recurring issues included the failure to recognise logical connections between questions and a misinterpretation of digital terms like “hardware”. An example for the logical connections between questions is as follows:

Question 1: Do you have hardware components in your institution?
Answer possibilities: yes no

Questions 1.1: If yes, how many of the following components are existing
Answer possibilities: Laptops:
Desktop Computers:
Phones:
Printers:
Server:

If the answer to question (1) was “no”, but the second part of the question (1.1) about the number of hardware was answered with “five laptops”, the result could be interpreted as a misunderstanding of the term “hardware”, but also as a wish for additional laptops.

This example might provide evidence of a lack of digital education, or it could indicate answer biases in terms of social acceptance, social desirability and subjective assumptions about the intention of a question. Furthermore, in some rare cases, the MFIs/SACCOs were aided in filling in the questionnaire if needed or requested. Against the background of gained knowledge in part one regarding the dependency on third-party investments for digital transformation in Africa, the mentioned evidence of low e-Literacy levels and answer biases seemed to be within the scope of validity. Consequently, the results of the survey are subjected to limitations in terms of objectivity, validity and reliability.

The following sections explain the conduction of surveys per project country.

Burundi

The Réseaux des Institutions de Microfinance (RIM) is a non-profit association created by microfinance institutions engaging in development for the benefit of the population evolving outside the traditional banking circuit. Currently, 39 microfinance institutions are affiliated, covering a volume of 99% of the entire market activities in microfinance in Burundi and a financial institution of the National Development Bank (BNDE). RIM is a professional, sustainable association whose members stand for efficient and professional banking, and it contributes considerably to the fight against poverty.

RIM's mission is to contribute to the promotion of the microfinance sector by supporting members in effectively performing their mission and defending their interests. In doing so, it emphasises professionalism, fairness, transparency and unity of members.

From 39 MFIs, a sample size of 36 was generated, which can be considered representative of the sector. The data collection was conducted online and on-site between February and March 2021. In the first four weeks, the questionnaire was published online via Kobo Collect Tool. Additionally, the local digital advisor in Burundi visited the institutions on-site, that submitted incomplete questionnaires or reported problems completing them, as well as MFIs whose data appeared to indicate comprehension issues. Not all issues were solved during the data cleaning. Not all irregularities could be eliminated during data cleaning, so that individual data had to be excluded from further analysis. Consequently, the sample size varied slightly between questions, as implausible answers were excluded. The sample size *n* is always mentioned for these variations.

In Burundi, a CBS is required by regulatory authorities; therefore, every MFI is equipped with one, which highly influenced the results of the survey in terms of hardware equipment and internet connection.

Kenya

In Kenya, an IT needs assessment was conducted in collaboration with the DSIK partner African Confederation of Co-operative Savings and Credit Associations (ACCOSCA). They promote African SACCO apex bodies in various ways; through ACCOSCA, Kenyan SACCOs are supported to adapt to a constantly changing business environment. The use of new digital concepts, such as shared IT services, enables them to cope with challenges as service delivery models evolve.

The survey was conducted through an external consultant, which led to severe challenges that were identified during a random quality assurance of the final report. The IT needs assessment first included an online and on-site questionnaire-based survey (original sample size 89), key informant interviews (sample size 8) and focus group discussions (sample size 5), which were conducted between April and June 2020. In the creation of the questionnaire, an ambiguous definition of different technologies, such as CBS, CRM and ERPs, led to a blend of these terms. Thus, slight editorial adjustments were made to the questionnaire after publication. Moreover, thematic deviations between the key informant interviews and the questionnaires/focus group discussions were identified. Furthermore, no records of the focus group discussions existed, and the analysis of existing research and information on the microfinance sector could not be used for reference. As a result, the survey was declared invalid. Therefore, information from the key informant interviews and focus group discussions will not be used further. A new evaluation based on the raw data from questionnaires (sample size 83) was performed, and the results were summarised in a fact sheet with a sound market analysis. The results of the digital survey in Kenya presented in section 5.3 must therefore be evaluated against the background of the academic limitations mentioned above.

Rwanda

In Rwanda, the digital survey was conducted in collaboration with the Rwanda Cooperative Agency (RCA), a public institution with the mandate to govern, supervise and promote the cooperative sector in terms of economic, social and other activities of general interest. Its mission is to develop the cooperative sector, including financial cooperatives like Umurenge SACCOs (village SACCOs), among others. RCA promotes an autonomous and economically viable cooperative movement founded on the cooperative values and principles that enhance social integration and uplift the standard of living of its members. The data collection was paper based during different workshops in August 2020. The data were digitised, and their quality was examined. From 373 questionnaires, 316 were considered in the report, leading to a quality rate of 84.7%. The survey was conducted by a local colleague with a working focus on digitalisation.

Tanzania

The digital survey in Tanzania was performed in collaboration with a partner, the Savings and Credit Co-Operative Union of Tanzania (SCCULT), an apex organization for SACCOs across Tanzania. The data collection should have been conducted online during different thematical workshops, but this was not possible due to limitations of access during the governmental election. As a result, the questionnaire was completed on paper. The data collection had to stop ahead of schedule after the workshops ended due to a topic-unrelated incident. A sample size of 152 was achieved until that moment, including SACCOs from all regions in Tanzania. Thus, the sample size was representative of the sector. The survey was performed by a local digital advisor in Tanzania. He digitised the data and performed data cleaning, achieving a quality rate of around 95% of the sample size.

Uganda

In Uganda, the Digital Financial Service (DFS) survey was conducted in collaboration with the Association for Microfinance Institutions Uganda (AMFIU). AMFIU is a national network of MFIs and related organisations spread across Uganda. By December 2019, AMFIU had 125 members. The association is an independent institution enjoying full legal status and complete autonomy in administrative and financial matters.

The survey was conducted from January to April 2020 as part of the strategic orientation of the office opening in Uganda in 2019 and collaborations with AMFIU as new partner. The survey was performed by the local digital advisor of DSIK in Uganda. Questionnaires were completed by MFI executives who were visited on-site. Additionally, a second digital advisor from DSIK responsible for Tanzania and Uganda worked remotely on the project. The results of the report have already been adopted in the activity portfolio in Uganda.

5.3 Key Findings and Evaluation

In this section, the main findings per country are presented as a summary of the key findings from each individual report. Further details can be found in these reports.

Burundi

Electricity

According to the advanced state of digitalisation in the Burundian microfinance sector, all MFIs are connected to electricity. Of 36 institutions, 35 are connected to the national energy supply, while one

uses a generator. In term of back-up solutions, only one small MFI has none (*n* = 35). Of 35 MFIs, 33 rely on generators as a back-up supply (12 large, nine mid-sized, 12 small), and five have solar panels (two large, two mid-sized, one small) as a second back-up solution to generators. One mid-size MFI use a UPS as second back-up, and one small MFI uses connection from another provider as a sole back-up solution.

Hard- and Software

As expected, the hardware and software are excellent. All the MFIs (*n* = 36) have basic IT hardware equipment in terms of computer/laptops, servers, inverters, printers and phones. The size of an MFI only influences the amount of existing hardware, which is explained by the size and thus the business volume of the MFIs. For example, the 12 biggest MFIs have 1,509 computers and laptops combined, which marks an average of 125.75 devices per MFI. The nine mid-sized MFIs only have 208 (arithmetic mean 23.1), and the 15 smaller MFIs only have 161 (arithmetic mean 10.7). This is congruent with the other hardware categories, including servers, inverters, printers and mobile phones.

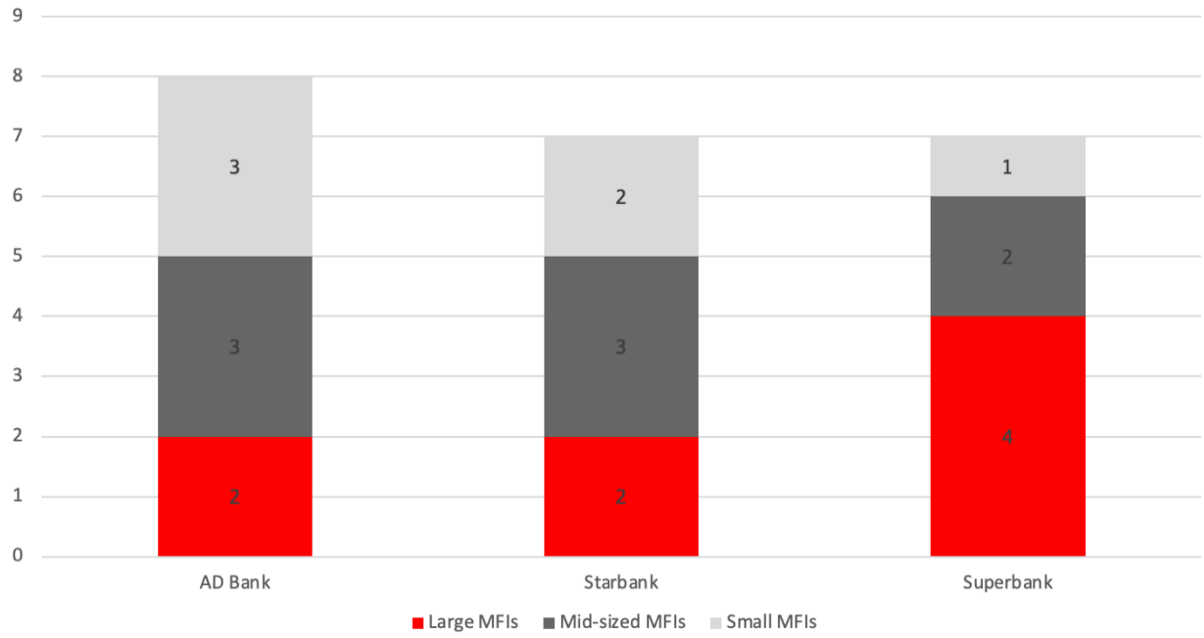

Figure 45: Top three implemented CBS at Burundian MFIs (*n* = 36)
(Source: DSIK illustration)

In terms of software, all 36 MFIs have a CBS. The top three implemented CBS are AD Banking (eight MFIs), Star Bank (seven MFIs) and Superbank (seven MFIs). Eight of 12 large MFIs have one of the three CBS, favouring Superbank (four large MFIs). Only four large MFIs have other providers, including CBS Vision (one MFI), Perfect Vision (two MFIs) and T24 (one MFI). For the mid-sized MFIs, only one had another CBS. Smaller MFIs seemed to prefer individual, less common providers like COBIS (one MFI), Core Banking Services (one MFI), Finance Solutions (two MFI), Map Finance (two MFI) and MIFOs (one MFI). Most MFIs' CBS fulfil regulators' requirements, except two MFIs; one large MFI, which is equipped with one of the three most implemented CBS, and one small MFI. The large MFI is currently undergoing an update of the credit module of the CBS to meet the requirements, while the smaller MFI performs the calculation of provisions and depreciations manually.

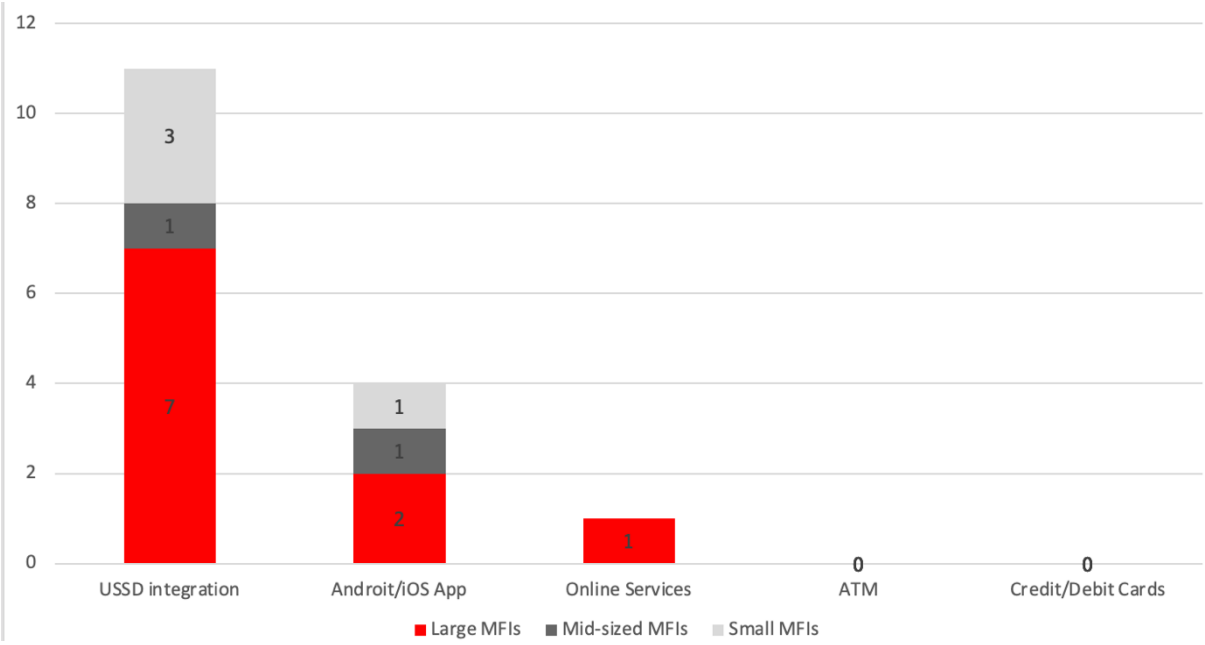

Figure 46: DFS for customers (*n* = 19)
(Source: DSIK illustration)

Around 52% (19 out of 36) MFIs offer a certain form of DFS services. From 19 MFIs, 11 offer USSD solutions through mobile money operators Lumicash and Ecocash, most often larger MFIs (seven MFIs). Only one mid-sized MFI offers mobile money solutions, as does three smaller MFIs. Mobile phone applications are still rare. Only four MFIs (two larger, one mid-sized and one smaller) offer an app for Android or iOS. Other online services for customers are only offered by one large MFI. ATMs or credit/debit cards are not offered by any MFI.

The results regarding further DFS adaptations (*n* = 30) were subject to limitations, as the technologies mentioned are already in use, thus the exact reasons for this can only be estimated. A realistic possibility seems to be the positive experience with the technology. Larger MFIs focus on topics such as mobile applications (five out of 11), ATMs (five out of 11) and back-up/cloud solutions (four out of 11). Only three (out of 11) larger MFIs focus on USSD, which is understandable given the adoption rate of over 58% (seven out of 12). However, the three larger MFIs mentioned are those that already use USSD solutions. Thus, the use is seen as important in the future but should not be associated with the fact that other larger MFIs interpret the importance of USSD differently. Medium-sized MFIs focus on use of USSD solutions (five out of seven) and modern back-up/cloud solutions (four out of seven) in the future. Smaller MFIs focus on USSD solutions (eight out of 12) and mobile application solutions (six out of 12). In summary, the main interest of MFIs is USSD solutions (17 out of 30), followed by mobile applications (13 out of 30), which was unexpected given the comparatively low smartphone penetration in Burundi and back-up/cloud solutions (11 out of 30).

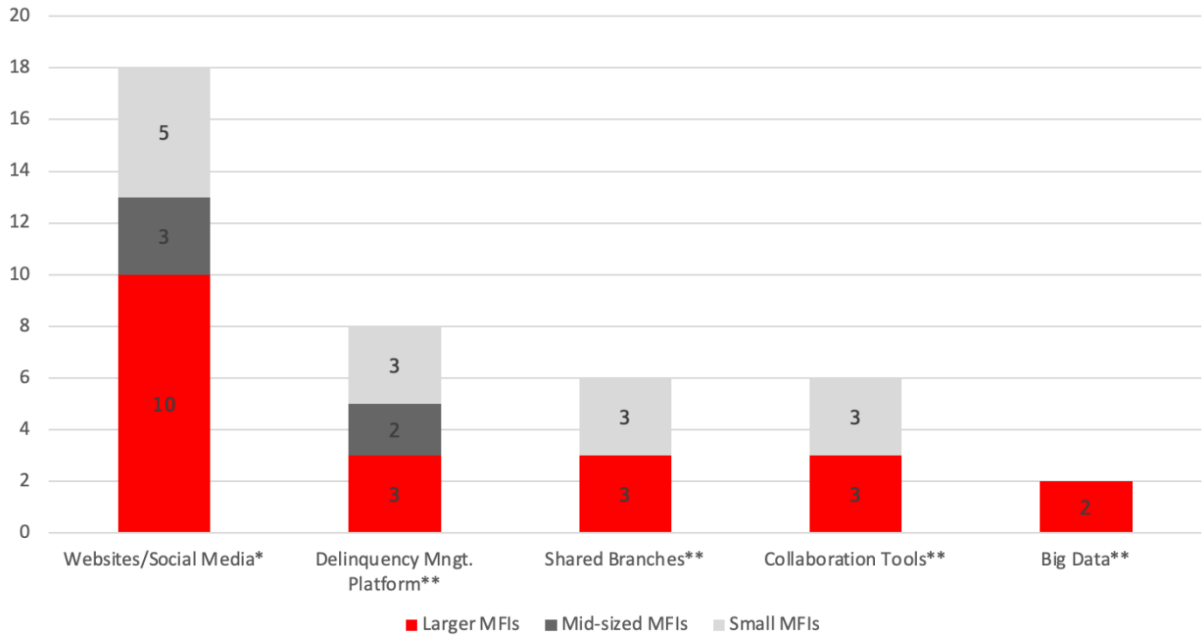

Figure 47: Further software solutions (*n = 35; **n = 19)
(Source: DSIK illustration)

Further software solutions, especially internal ones, are not common; public websites and social media channels are more common. Of 35 MFIs, 20 have more online channels for external appearance. Larger MFIs are again better represented in this category. Over 80% (10 out of 12) have a website or comparable social media presence. Only around 66% (six out of nine) of the mid-sized MFIs and 50% (five out of 10) of the small MFIs have an external appearance.
For modern IT solutions (n = 19) like shared branches, big data or delinquency management, the situation varies. Only about 42% of MFIs use tools for delinquency management. Considering the size, around 38% (three out of eight) of larger MFIs, 50% (two out of four) of mid-sized MFIs and around 43% (three out of seven) of smaller MFIs. Collaboration tools like Microsoft applications are used by 32% of MFIs, mainly larger MFIs (three out of eight) and smaller MFIs (three out of seven). In terms of shared branches, only about 32% of MFIs use such technologies. This comprises 38% (three out of eight) of larger MFIs, no mid-sized MFIs and about 43% (three out of seven) of smaller MFIs. Only two larger MFIs (out of eight) use big data, which marks only 25% of larger MFIs and 11% of all MFIs. However, the smaller sample size (n = 19) must be considered when evaluating these results.

Network
All MFIs (n = 36) use networks for connecting devices. Thirty-three MFIs use local networks, while three MFIs use internet-based networks (one mid-sized, two small). Internet connection is also widely spread. Of all MFIs (n = 35), 32 have internet connection; only three smaller MFIs have none. In terms of internet speed (n = 31), only two large MFIs and two mid-sized MFIs have a speed over 10 Mbps. Most MFIs (16 in total, seven large, four mid-sized, five small) have between three and nine Mbps. However, 11 MFIs (three large, two mid-sized, six small) have less than two Mbps.

Conclusion
These results showed that all MFIs have a decent level of basic IT equipment and decent knowledge on how to use them. Specifically, larger MFIs are well equipped and can even offer DFS solutions to customers. Smaller MFIs are less equipped and are more likely to experience slow or no internet. For the activity portfolio in Eastern Africa, a focus on smaller MFIs rather than larger MFIs fosters the

digital transformation of these institutions and also prevents them from falling further behind. Activities allowing interoperability and connection to mobile money will have the biggest impact. Furthermore, activities for larger MFIs that are more focussed not only on digital point of sale (POS) but also on ATMs, card payments, additional monitoring and performance tools will have a good impact.
In this context, an additional e-Wallet survey is being conducted in Burundi to analyse different forms of payment interconnections, such as the connection to the national payment switch B-SWITCH, mobile money integration and an individual e-wallet. The results will have an important impact on further activities.

Kenya

The digital survey in Kenya revealed emerging evidence that the e-Literacy level and digital readiness in Kenya is higher compared to the other project countries. This was supported by an IDI score of 2.94, which makes Kenya the leading country in terms of → Digital Readiness in Eastern Africa. The success of m-Pesa (→ Mobile Money) also contributes to this readiness.

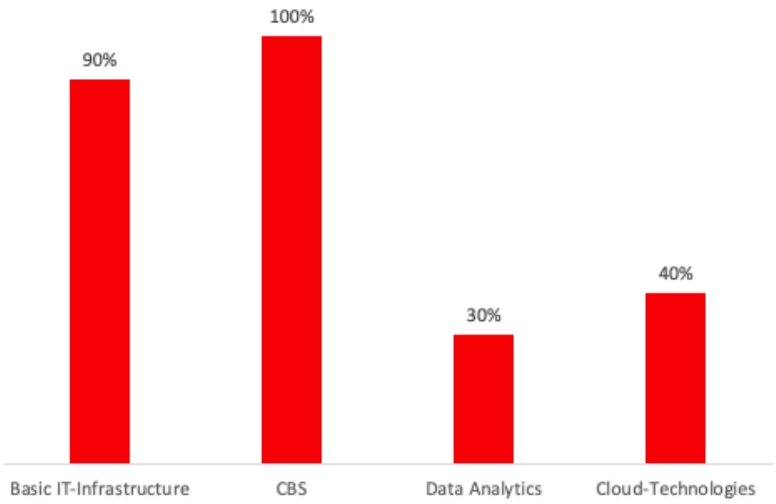

Figure 48: Key findings of IT infrastructure in microfinance sector in Kenya
(Source: DSIK illustration)

Basic IT Infrastructure
Of all surveyed institutions, 90% stated that they have a basic IT infrastructure that includes desktop computers, laptops, basic word processor software, CBS and internet connection and covers the basics of hardware and software components, as well as network. The existence of a CBS was highly scored at 100%; however, this percentage needs to be scrutinised. Exchanges with stakeholders from Kenyan MFI and SACCO sector provided evidence that professional CBS are lacking, leading to the subjective assumption that the stated CBS solutions are basic software or MS Excel-based solutions. Further, the understanding of characteristics of a professional CBS might differ. However, based on the conflicting data, objective derivations are not possible, and further research is needed.

Implementation of Advanced Digital Concepts
About 30% of SACCOs already use data analysis, while 40% use cloud technologies. Additional CBS features, such as risk-management or customer-relationship management, are used by just 20%.

Shared services are mainly offered by larger financial institutions, but the market of solutions for smaller institutions is limited. Therefore, few SACCOs use shared services, although 93% of SACCO executives believe in the importance of such solutions for their business. In summary, the results indicated an existing need for improvement and further support to foster and possibly even accelerate the promising process of implementation of advanced technologies.

e-Literacy

The general quality of the answers given was much higher, which led to a decreased effort in data cleaning as the cause of data quality problems was found in the questionnaire. However, education and knowledge aspects accompanied the digital survey in Kenya from the beginning, as different or incomplete understandings of technology and finance contributed to the data quality issues, as highlighted in chapter 5.2. Furthermore, in rural areas, where broadband access is not yet available, e-Literacy is lacking, and digital readiness is likely low. This is particularly valid for the central, northern and western regions of Kenya.

Although digital transformation is still in early stages, the indications and findings in Kenya are promising for the future progress of digital transformation. For the activity portfolio of DSIK in Eastern Africa, existing CBS solutions and future software needs, such as CRMs, ERPs and monitoring or performance tools, should be examined further to strengthen and professionalise the microfinance sector in Kenya. Additionally, the concept of shared services must be promoted and considered as a cost-saving solution for digital transformation. Thus, further activities in this direction are recommended.

Rwanda

Rwanda was already mentioned in the introduction as an example of financial inclusion driven by effective governmental guidance. The establishment of U-SACCOs in Rwanda greatly impacted financial inclusion, reaching 89% of the population. However, digitalising all 416 U-SACCOs, including a consolidation of district SACCOs at an intermediate level for easier management, is challenging. DSIK Rwanda is part of the digitalisation project for the U-SACCOs initiated by the government to establish basic hardware and core banking systems. A collaboration between the Rwandan government and Korea Telecom (kt) led to an established country-wide LTE network, offering highspeed internet access to 90% of the population. The network is now operated by kt Rwandan Network, a company owned by kt and the Rwandan government. The following findings must be interpreted against this backdrop.

Hardware, Software and Network

In terms of hardware, software and network, all U-SACCOs will receive basic IT hardware, CBS and internet connection through the ongoing project of SACCO consolidation and automation. Thus, DSIK provide data cleaning support and support in data digitisation, which are already occurring. However, the results indicated that terms and specifications of hardware and networks are not fully understood by the U-SACCO representatives in this survey; differences between different technologies like laptops and desktop computers and different technologies for internet connection are not fully understood.

Additional Software

The survey also revealed which digital solutions are desired after the automation. Of the SACCOs, 22% would like to implement a mobile banking app; within the top 11 largest SACCOs, this percentage is slightly more, at 23%. Furthermore, 19% request shared services, which is comparable to the top 11, where 17% mentioned this request. An ATM connection is considered most important by 17%, even more so by the top (26%).

Electricity

Of the surveyed U-SACCOs, 97.7% have electricity. Only 2.3% are not connected, including two of the 11 largest SACCOs. This was unexpected and may require further verification. In addition to the lack of connection, the two larger SACCOs also did not provide monthly electricity costs but referred to backup solutions, such as solar and generators, which would explain the lack of connection to the public grid. Regarding blackouts, the public grid is more stable in Kigali compared to rural areas, which experience more disruptions, especially in the East and South of Rwanda. Moreover, 81% already have an alternate backup solution. Of those who have none, over 82% experience this as a challenge.

Digital Promotion

In terms of digital promotion, only 10% of U-SACCOs have a website, while 75% are planning to build one in the next three years. In conclusion, 15% do not identify it as a need or opportunity for their institutions. In terms of large U-SACCOs, only 50% of the top 11 U-SACCOs plan to build a website in the next three years, consequently leading to an additional 50% that do not see any need or opportunity to implement one.

Education and Knowledge

As mentioned, the digital transformation of the U-SACCOs is accompanied by the government in the process of automation. Thus, 80% of the U-SACCOs have a positive attitude towards digitalisation. In addition, 85% feel well prepared for digitalisation and the upcoming automation. However, participating staff of U-SACCOs in Kigali were a little more sceptical; just 65% feel well prepared. The reasons can only be assumed. One reason could be different assumptions or different knowledge about the automation, which could lead to a different evaluation of the situation.

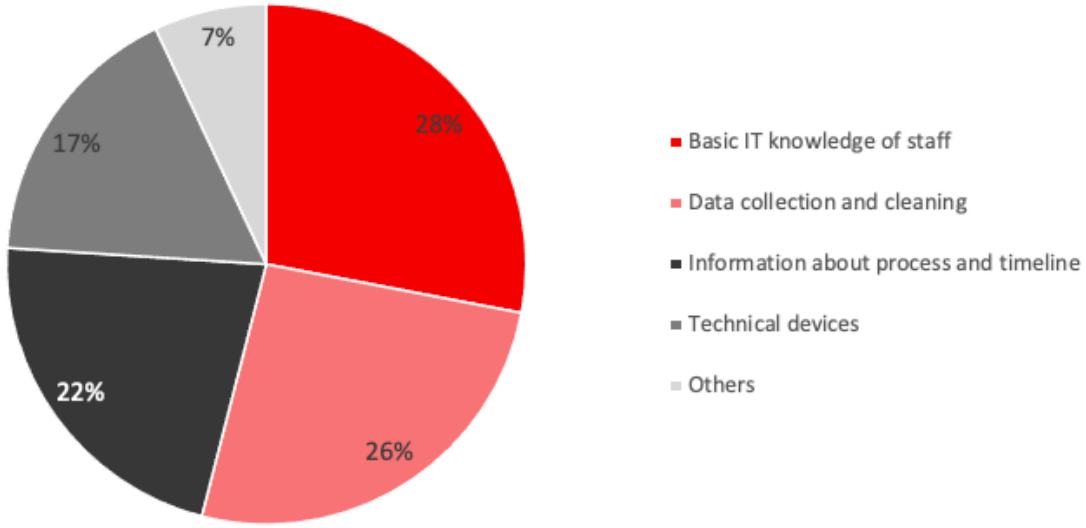

Figure 49: Knowledge topics of interest
(Source: DSIK illustration)

Of all participants, 18% (every fifth person) would like to obtain more information on digitalisation, while every fourth person already feels well prepared. Out of these 18%, 28% see the need for more knowledge on basic IT for staff, 26% would like to have more details on data collection and cleaning in the process of automation, 22% would like to get more general information on the process and timeline of automation, and 17% are interested in more information about digital devices.
All SACCOs have a certain form of internet connection; thus, e-learning offers could be a solution to the indicated knowledge gaps and the request for further knowledge regarding the topics above. The 11 largest SACCOs already offer some form of e-learning to their employees, but only two out of 10 employees use it. The reasons for this lack of adoption should be examined more closely. The reasons could include low e-Literacy levels, which would hinder the use of digital learning platforms; incorrect content; or improper depiction of the content.
In addition to the mentioned knowledge topics, two knowledge questions about digitalisation and shared services were asked. Only 42% answered correctly regarding the term “digitalisation”, and 80% answered correctly regarding “shared services”. Most answers limited the term “digitalisation” to the process of digitising analogue data to digital data or to the implementation of a CBS, without considering a larger framework. This emerged as evidence of a lack of understanding.

In addition to the support of data cleaning, the results revealed further needs for trainings in the area of e-Literacy, digital marketing and further follow-up activities with regard to additional software solutions after automation that could be considered in the activity portfolio of DSIK Rwanda.

Tanzania

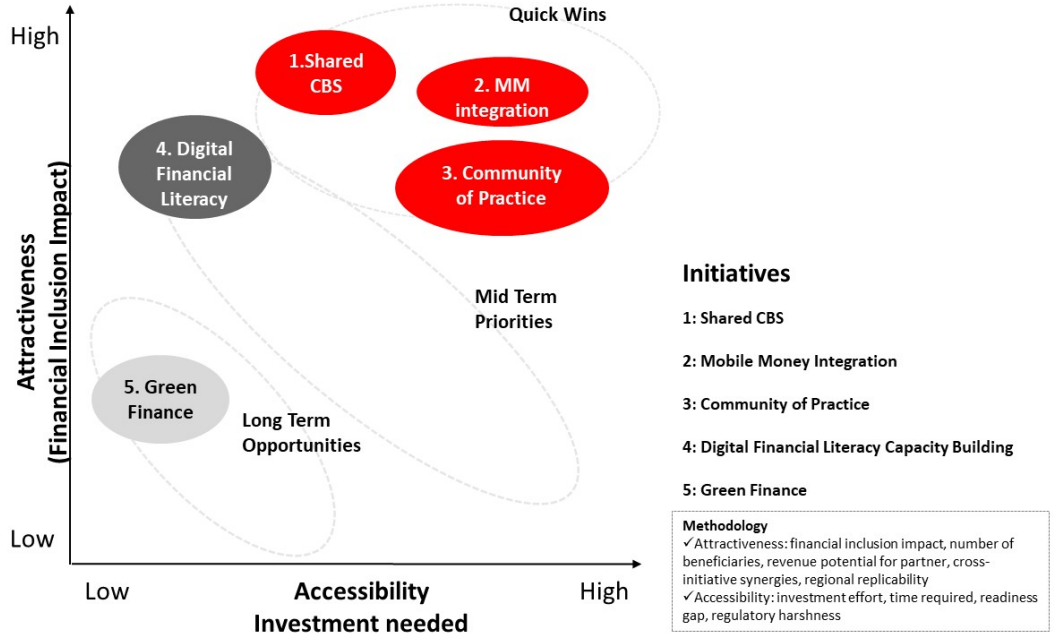

Figure 50: Fields of interventions in Tanzania
(Source: DSIK illustration)

The digital survey in Tanzania revealed five areas of intervention (Fig. 50), which differ in number of necessary investments and their impact on financial inclusion.

IT Infrastructure and Shared CBS

CBS solutions contribute significantly to financial inclusion and are a prerequisite for further DFS interventions. Currently, only 19% of the surveyed institutions have a CBS, while 46% plan to implement one in the future. In conclusion, over one-third (35%) still have no plans to implement a CBS, which was unexpected considering the increasing regulatory requirements and competitive pressure from mobile money providers. A CBS implemented as shared service on the apex level creates a win-win situation for apex organisations as an additional revenue stream, as well as for SACCOs in terms of cost-saving measure, and method for professionalising business. Focussing on scalable and needs-oriented ICT infrastructure is critical to avoid unnecessary high investments, which often cannot be covered independently. Better data handling and transparency, while enhancing the trust and usage of financial products, also accelerate financial inclusion. The implementation of CBS not only requires investments but also increases the access to professional financial service tremendously.

Mobile Money Integration

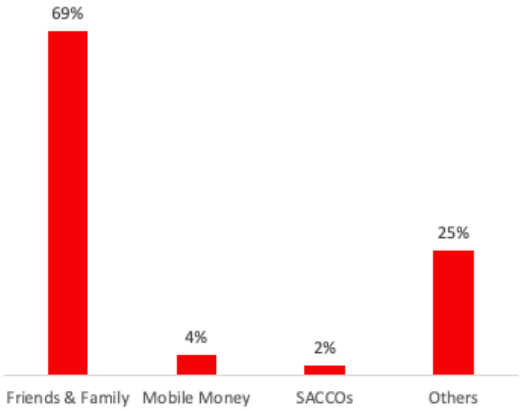

Figure 51: Borrowing behaviour
(Source: DSIK illustration based on FinScope, 2017)

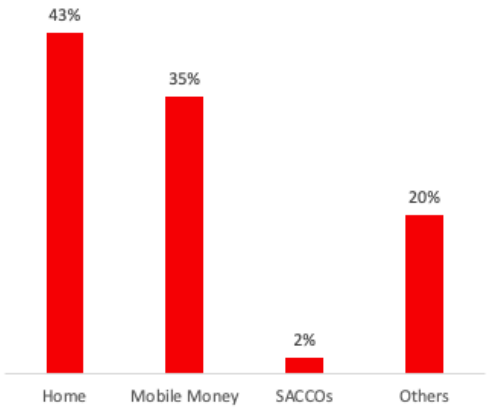

Figure 52: Saving behaviours
(Source: DSIK illustration based on FinScope, 2017)

Of the Tanzanian population, 95% have access to mobile phones, 63% own one, and at least 26% have access to the internet. Thus, mobile money solutions working on USSD are most preferred by Tanzanians. Sixty percent of the population use mobile money services, but only 5% of SACCOs offer mobile money solutions or are connected to one for payment transactions. In terms of loans, 69% borrow from family and friends, 4% via mobile money, and 2% from SACCOs. In terms of savings, 43% save at home, 35% via mobile money, and 2% at SACCOs. This creates an opportunity for SACCOs to close the gap with specialised DFS through mobile channels while enhancing the security of members and offering convenient saving solutions, particularly loan disbursements and repayments (Financial Sector Deepening Trust 2017).

Community of Practice

As most SACCOs do not have a CBS, offering DFS solutions is not possible. Nevertheless, 58% want to implement DFS but are hindered by high costs (27%). For 42%, DFS is currently not of interest. No interest in digital solutions and the hurdles of implementing digital solutions, like substantial funds and efforts, are an economic risk, as the regulatory environment is changing, competitiveness is increasing, and the effort needed to close the digital gap is growing. DSIK Tanzania can support the SACCOs by establishing exchange platforms and communities of practice on the SACCO and apex level to educate about digital solutions and their benefits. Furthermore, the project can collaborate in addressing the hurdles. Such collaboration in sharing knowledge and technical solutions will reduce the cost of for each participant and strengthen the position of the apex organisation.

Digital Financial Literacy

The data cleaning already indicated gaps in e-Literacy and financial education, and evaluation of the participants' answers confirmed this indication. Ninety percent would appreciate more information about digitalisation, while 56% would like additional training. This revealed a demand for more information, as well as a certain ambiguity and uncertainty in handling of technology. In addition to communities of practice, specific trainings would be expedient to promote digital transformation and overcome obstacles. The rising number of mobile money subscriptions also indicates that an increasing amount of training is required for end-beneficiaries, who should be empowered to use the DFS in the future. This will require investments but will also increase financial inclusion over the mid-term and is a prerequisite for DFS.

Green Finance

Like in other project countries, a stable electricity supply is not guaranteed. Green finance products like PayGo Solar Credit can guarantee smooth operation of ICT infrastructure for SACCOs and MSMEs. Additionally, green finance products like solar panels could be a business model for SACCOs and could increase the access of end-beneficiaries to a reliable power supply. Compared to other topics, green finance is relatively new for DSIK in Eastern Africa; thus, the implementation will require a certain level of effort, but the impact will be tremendous.

Uganda

The survey in Uganda revealed that the biggest challenges are reliable electricity, as well as the complexity and financial aspects of implementing CBS and DFS solutions. Additionally, gaps in knowledge and education exist at the level of the end-beneficiaries and MFI/SACCO staff.

CBS and DFS Implementation and Related IT Support

Of all surveyed institutions, 88% have implemented core banking systems, while 57% have adopted DFS. This finding was supported by the IDI score of 2.19, which marks the second highest digital readiness in the region. Around one-third (29%) highlighted the high cost of implementation and maintenance of CBS and further costs for DFS implementations as a major barrier to adoption.
For institutions that had already implemented DFS, over two-thirds (69%) were only able to implement the solutions through donor funds and have to bear with maintenance costs.
In addition to the high costs, insufficient technical knowledge and skilled IT staff have complicated the maintenance and development of digital solutions; only 12% of the institutions have qualified in-house IT staff. Others depend on third-party support, which is reportedly unreliable and has missing SLAs.
In terms of DFS from customers' perspective, mobile-based channels are the preferred option, as 44% of Ugandans having a mobile subscription. However, much potential is still untapped. Implementation of a shared platform could alleviate these challenges for many of the MFIs/SACCOs.

Alternative Electrification (Green Energy)

Electricity is a key enabler for the success of digitalisation, but the challenges with electricity (availability, accessibility, reliability and affordability) are comparatively huge. Only 28% of the Ugandan population have access to electricity, and only 7% have electricity service in rural areas. Unstable electricity supply is a common phenomenon in rural areas. Of the interviewed MFIs/SACCOs, 72% have a back-up power supply. Of these institutions, 50% have both solar and generators, 36% have only solar systems, and 14% only have generators. Efforts should be made to design and implement electric solutions for MFIs/SACCOs and their customers. For this, green energy alternatives are viewed as the most suitable alternative. However, MFIs/SACCOs are struggling with access to high-quality solutions, as those available on the market are often uncertified. Thus, links to high-quality solar solution providers are necessary to ensure reliability of these solutions and further allow for affordable energy sources. Green energy solutions could further be extended to the microfinance clients as products to promote inclusive digital finance services further.

Digital Financial Literacy

A digital financial literacy program must be designed and implemented in order to drive financial service adoption. The majority of Ugandan adults (70%) have not achieved a secondary level of education, which could be the reason for low levels of financial literacy. This program would improve their awareness levels of DFS in microfinance and ultimately result in the uptake and usage (currently at an average of 15%) of these channels. Building capacity within the institutions is critical to drive internal buy-in and ownership of the DFS and to foster IT knowledge, as 50% mentioned that they face difficulties during selection of solutions and implementation. A digital literacy program tailored for MFI/SACCO staff is therefore required. In addition, creating awareness regarding customers' reservations in terms of fraud, service availability and service support for complaints will accelerate the use of DFS solutions.

Investments in IT Infrastructure

In addition to electricity, DFS also relies on stable connections, most often internet connections. Of the surveyed institutions, 80% experienced unstable and unreliable internet connectivity in the past three months. This highly influences the work of DSIK in Eastern Africa and can neither be solved by any partner nor DSIK; investments and infrastructure projects from the government are necessary to enhance the quality of connection.

Credit Information Sharing System (CISS)

All interviewed institutions singled out multi-borrowing as a major risk factor and concern among the borrowing customers. In the absence of a digital platform to serve as a credit reference bureau for Tier 4 institutions, some institutions have opted for manual alternatives of sharing information on borrowers through What's App groups and phone calls. The Microfinance sector must establish a CISS to safeguard the industry from the risk of customers over-borrowing.

Innovation Hubs

In addition to the key findings, DSIK Uganda encourages building close partnership with existing innovation hubs, as DFS is evolving rapidly, and numerous innovations are emerging. Based on the conducted survey in Uganda, all MFIs/SACCOs are at an entry level of digital transformation (implementing bank-to-wallet and wallet-to-bank). Adoption of new technologies, such as cashless loan disbursements and repayments, digital field applications to allow for remote/off-site customer enrolment, AI and so on, can spur the adoption of DFS in microfinance. Therefore, links between the MFIs/SACCOs, innovators and innovation hubs must be created to facilitate this journey.

The implications for the activity portfolio in Uganda include further support for the implementation of CBS on an apex level as a shared service with intention to foster the implementation of CBS solutions for the remaining MFIs/SACCOs and to strengthen DSIK partners in the country. Additionally, the implementation of a CISS and a focus on shared services will gain quick wins as well as mid-term advantages.

6 Conclusion

In conclusion, the positive impact of digitalisation and thus its importance in development cooperation for achievement of several SDGs are undeniable.

The desk research showed that there are opportunities in digitalisation and that the obstacles to digital transformation in Africa are unique. If correctly implemented, digitalisation could reach marginalised parts of the population and renew wider parts of the economy, including the financial sector. Consequently, digitalisation could leapfrog development steps in the African continent. The aspects of digitalisation in Africa are unique, as most innovations in the financial sector emanate from MNOs and start-ups, usually non-financial sector businesses. However, digital transformation on the African continent also faces unique obstacles, including the availability of hardware, software and internet, as well as the affordability and ability to use them. In addition, knowledge, level of education and e-Literacy are comparatively low, leading to a lower demand for digital solutions (appetite). Therefore, low-tech solutions are preferred by large parts of the population, as other solutions are out of reach in terms of affordability. In consequence, more advanced technologies and innovative concepts like AI, big data analysis, cloud computing, IoT and smart housing, as well as e-learning, are less common. Furthermore, access to internet and ownership of smartphones for larger parts of the population is low, especially among individuals with a lower educational level, with a lower income, who are older of age, who are from rural areas, who are women or who have disabilities. These are the most disadvantaged groups when it comes to digitalisation, which highlights the implications for development cooperation and provides a strategic direction for the digital activities in the project portfolio of DSIK in Eastern Africa.

The digital surveys in Eastern Africa have revealed that digital readiness in terms of reliable electricity, hardware, software, network and knowledge is lacking. The main challenge is not access, as hardware for the African market exists and the network coverage and IT infrastructure have improved significantly over the last years. Instead, two main challenges were identified: the affordability of solutions and e-Literacy. Many MFIs/SACCOs are aware of the benefits of digitalisation, but hurdles like high investment and maintenance costs hinder them. Furthermore, technical terms like hardware, digitalisation and digital transformation are not fully understood. Finally, the need for further exchange formats was also identified within the region. These aspects have implications on RP1, Vocational and Commercial Education in EA.

In terms of implications for RP2, Rural Development through Institutional Strengthening of Microfinance Sector, the surveys revealed that in some contexts, basic IT infrastructure, such as hardware, CBS and reliable electricity or power backup solutions, is still missing. For MFIs/SACCOs that already have IT infrastructure, the topic of interoperability was highlighted. The additional survey in Burundi revealed further needs for solutions to establish interoperability through technical solutions, such as e-Wallets, connection to national payment switches and mobile money platforms. In other contexts, the surveys revealed further software requirements, like CRM-Tools, ERP, DMS and performance monitoring tools. Furthermore, the focus on innovative concepts like cloud computing and shared IT services will increase in the future. This will include solutions like CBS, performance monitoring tools, CRB and others. Enhancing the digital promotion of apex organisations and MFIs/SACCOs was identified as a side topic.

This working paper serves as a basis and preparation for an IT strategy for the regional projects in Eastern Africa. In the context of this strategy, the focus groups of lower education levels, lower income, higher age, rural population, female gender, and disabled people were identified. Digital values, which shall serve as ethical guidelines for future activities with digital components, must be defined in this strategy for DSIK in Eastern Africa. Furthermore, a comparison should be made between the identified topics and pre-existing knowledge levels of DSIK internally, and an impact analysis of the mentioned topics should be conducted. Therefore, a multidimensional approach is important for evaluating and solving challenges and providing benefits from different perspectives. This will lead to an increased complexity, which is necessary to identify inhibitors. Partnerships with digital providers are often long-term; thus, it is beneficial for the partner organisations, as well as MFIs/SACCOs, if DSIK in Eastern Africa has a network of trusted providers and innovation hubs and performs regular analysis and screenings regarding technological trends and market analyses. Finally, further research in areas include start-ups/MSMEs, innovation hubs, the rural-urban divide and mobile money trends could be beneficial for the project.

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