Mobile money and financial inclusion in Africa: Emerging themes, challenges and policy implications

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ABSTRACT

Mobile money is purported to promote financial inclusion. The growing number of studies have largely focused on transactions and related benefits with limited attention to emerging challenges, policies and initiatives that address the relative needs of different stakeholders. Consequently, little has been done to probe the ‘bottom-of-the-pyramid’ paradigm that underpins these assumptions. There has been inadequate endeavour to examine ways that empirical research could shed more light on these challenges and how to overcome them. To address these gaps, this study reviews the emerging literature on mobile money that explores both benefits and challenges. From our study three main themes emerge that suggest areas where challenges to the efficacy of the mobile money-financial inclusion link still appears not to have been adequately addressed by policymakers: ensuring integrity, privacy and security; addressing resource and infrastructure constraints; and integrating stakeholder benefits. Yet we suggest merely addressing these challenges does not go far enough in safeguarding the needs of local communities, as major stakeholders. Evidence from our study suggests little direct benefit to the poorer sections of local communities, only to the strata above and to elites and external stakeholders. This has implications for development and social change through technology adoption.

1. Introduction

The introduction of exogenous financial technology in development projects to increase financial inclusion in poorer communities, including the introduction of mobile money, is an area that has been increasingly debated within the pages of Technological Forecasting and Social Change (e.g., Asongu and le Roux, 2023; Avom et al., 2023; Djahini-Afawoubou et al., 2023; Johnen et al., 2023; Mogaji and Nguyen, 2022) and other scholarly journals. Research undertaken in this area predominantly appears to present a positive spin, given impetus by the apparent success of M-Pesa in Kenya (Tyce, 2020). Ozili (2021) contends that this is mainly because the majority of scholars working in this area are affiliated with and funded by institutions that have a vested interest in promoting fintech innovations and financial inclusion. This observation calls for a more critical examination of existing studies as we do in this paper.

Such research on mobile money and financial inclusion focuses largely on the implementation and benefits of mobile money (Munyegera and Matsumoto, 2016; Mothobi and Grzybowski, 2017; Geng et al., 2018) with insignificant or no attention paid to balancing stakeholder interests and required policies and initiatives to leverage expected gains for business providers, for policymakers, as well as maximizing benefits to local communities and users at the so-called ‘bottom-of-the-pyramid’ (Prahalad and Hart, 2002). This underscores how stakeholder interests are important for business, policy and development.

There are also limited references to related African innovation, local interaction with transferred-in technology and the sometimes negative effects on these important community stakeholders who appear to have a weak voice when it comes to policy and implementation in this area. These are serious gaps, particularly as financial inclusion, fintech developments and more recently the introduction of mobile money to African communities in this regard, is being seen as a significant factor in international development interventions (Suri and Jack, 2016). Despite the copious number of studies on mobile money in Africa critical reviews are sparse. This study contributes to the literature by purposively reviewing pertinent existing literature on mobile money in the context of financial inclusion in Africa to identify both benefits and challenges. In particular, there is a need to more fully understand the challenges in the context of development policy and interventions with a view to the relevant stakeholders. The benefits have been well rehearsed

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0040-1625/Crown Copyright © 2024 Published by Elsevier Inc. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).
addition, the drive towards financial inclusion, made possible by mobile technology allows the previously unbanked to have access to useful and affordable financial products and services (Geng et al., 2018; Mbiti and Weil, 2011). For example, in Kenya, with large portions of the population having access to mobile phones, mobile money payments have become common (Geng et al., 2018; Mbiti and Weil, 2011). Mobile phone penetration and internet usage are mutually inclusive means through which digital financial services foster financial inclusion. Mobile phone penetration creates opportunities for expansion of financial services and increases the role of non-financial institutions. In addition, the drive towards financial inclusion, made possible by the mobile phone platforms, does not appear to discriminate along the lines of income, class, or age group (Agyekum et al., 2016; World Bank, 2018). The use of a mobile phone appears to increase the likelihood of being financially included as mobile technology allows the previously unbanked to perform financial transactions. The mobile money platform facilitates payments for utility bills, fees, fund transfers and other financial services (Donovan, 2012; Jack and Suri, 2011; Senyo and Osabutey, 2020). Jack and Suri (2014) in a non-experimental panel data analysis, found that the reduced transaction costs through mobile money usage in Kenya enabled users to absorb large negative income shocks better, without any reduction in household consumption, compared with non-users. With respect to shocks, Koomson et al. (2021) observe that mobile money in Africa augments the ability to send and receive financial support during idiosyncratic shocks such as the recent pandemic. Arguably, the benefits of digital payments go beyond convenience; if provided efficiently and effectively, they can transform the financial lives of individuals and communities (World Bank, 2014; Batista and Vicente, 2020).

Fintech generally, or the provision of financial services through technology such as mobile phones, is said to widen access to financial services (Gai et al., 2018; World Bank, 2018; Avom et al., 2023). Hence, emerging technologies are allowing telecommunication firms to provide financial services (Demirgüç-Kunt et al., 2018). Financial inclusion involves access to useful and affordable financial products and services such as payment, deposit, insurance and loans by individuals and organisations (Dev, 2006; Lashitew et al., 2019; N’dri and Kakinaka, 2020). Financial inclusion appears to play a role in alleviating poverty and improves welfare in developing countries, such as those in Africa, as part of the means to achieve sustainable development goals (N’dri and Kakinaka, 2020; Djahini-Afawoubo et al., 2023), with mobile money as a key enabler of financial inclusion (Peruta, 2017). It is said to improve the livelihoods of individuals residing in rural and remote areas by providing them with access to financial services that otherwise would not be available.

While individuals with higher disposable incomes are more likely to adopt mobile money transactions (Mothobi and Grzybowski, 2017), there are suggestions in the literature that all income groups benefit (Mothobi and Grzybowski, 2017; David-West et al., 2019; N’dri and Kakinaka, 2020; Senyo and Osabutey, 2020). The adoption of mobile money therefore improves remittances, financial transactions, household welfare and reduces poverty and vulnerability especially among the rural poor (Manyegera and Matsumoto, 2016; N’dri and Kakinaka, 2020; Balasubramanian et al., 2023). This is because in Africa most people in urban areas have links with their native hometowns mostly in the remote rural areas where they often send remittances to their relatives (Geng et al., 2018; Senyo and Osabutey, 2020). Therefore, the speed, convenience and cost-effectiveness of these financial transactions appear to be enjoyed by a range of income groups from the urban middle class to the rural poor and those at the ‘bottom-of-the-pyramid’.

The literature on Africa also emphasises how digital technologies are improving agricultural productivity in rural areas (Wyche and Steinfield, 2016; Mothobi and Grzybowski, 2017; Batista and Vicente, 2020). It is not surprising that mobile money is the most dominant fintech innovation across Africa and adoption is widespread and continues to increase. However, the emerging literature does not sufficiently get into the nuances of these proclaimed benefits and little emphasis is placed on identifying challenges and how policies and initiatives could overcome them. Some of the key benefits referred to in the literature are outlined in Table 1, as are the main identified challenges these studies suggest, and discussed in the next section. These particular studies have been selected because they go beyond simply lauding the benefits of mobile money and the connection to financial inclusion to allude to some of the challenges faced by the introduction of mobile money to local communities. The case for mobile money facilitating financial inclusion is therefore strong, yet its introduction and implementation still provide challenges, many of which are recognized in the literature we review.

3. Challenges and required policies and initiatives in Africa

Our review of, purposefully and carefully, selected literature on reported benefits and challenges of mobile money in Africa from 2013 to 2023, summarized in Table 1 and discussed under, suggests three themes related to key stakeholder challenges. By implication, these challenges require addressing through appropriate policies and initiatives. We therefore categorise them as key policy issues as follows: (1) ensuring integrity, privacy and security; (2) addressing resource and infrastructure constraints; and (3) integrating stakeholder benefits.

3.1. Ensuring integrity, privacy and security

Every new technology, if not managed properly, can be beset with issues around ensuring integrity, privacy and security. Their identification is important for the success and sustainability of new technologies. These issues also heighten anxieties. For example (see Table 1), Batista and Vicente (2020) note that central banks regard mobile money as risky innovation, in need of tight regulation. While the anxieties of some banks may have merits, they could be viewed as a response to unwanted competition that fintech innovation brings. However, N’dri and Kakinaka (2020) agree that better financial and telecommunication regulation is required to sanitise the resulting financial and technology ecosystem. De Koker and Jentzsch (2013) argue that since mobile money
Table 1
Selected reported benefits and challenges of mobile money in Africa (2013–2023).

<table>
<thead>
<tr>
<th>Authors</th>
<th>Mobile money name</th>
<th>Research method/country</th>
<th>Benefits of mobile money service/Fintech</th>
<th>Key stakeholder challenges and required policies and initiatives</th>
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<tbody>
<tr>
<td>De Koker and Jentzsch (2013)</td>
<td>Various; more focused on financial inclusion in 8 African countries</td>
<td>Quantitative (secondary data)/ Botswana, Kenya, Namibia, Nigeria, South Africa, Tanzania, Uganda, &amp; Zambia</td>
<td>• Increases banking services for the unbanked&lt;br&gt;• Facilitates monitoring of financial transactions&lt;br&gt;• Expands surveillance capacities of law enforcement agencies&lt;br&gt;• Complements anti-money laundering and counterterrorism financing.&lt;br&gt;• Enhances transparency.&lt;br&gt;• Increases taxation.&lt;br&gt;• Government policies and action on taxation and tax enforcement and on financial inclusion serve the broader public good and are aligned.</td>
<td>• Governments need to develop better understanding of customer choices between formal and informal financial services.&lt;br&gt;• Alignment strategy between financial inclusion and financial integrity needed.&lt;br&gt;• Individuals are concerned about the disclosure of their information to the government or other parties.&lt;br&gt;• Fear of loss of privacy and increased government surveillance.&lt;br&gt;• NGOs and other agencies should initiate general privacy education.&lt;br&gt;• Policymakers should monitor, support and enforce privacy laws.&lt;br&gt;• Identity theft and cybercrime. Sustainability of financial inclusion initiatives.</td>
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<tr>
<td>Osei-Assibey (2015)</td>
<td>Mobile Money</td>
<td>Quantitative/Ghana</td>
<td>• Perceived risk, education level, relative advantage and age influences adoption</td>
<td>• Mistrust and high charges deter many traders.&lt;br&gt;• Separate oversight authority or regulator required to check high charges, service quality, exploitation etc.&lt;br&gt;• A challenge to encourage more savings among low-income earners.&lt;br&gt;• Expanding range of services (payment of utility bills, school fees, etc.)&lt;br&gt;• The effect of local economic conditions and infrastructure</td>
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<tr>
<td>Munyegera and Matsumoto (2016).</td>
<td>MTN Mobile Money, Airtel Money, M-Sente, Warid Pesa, Orange Money</td>
<td>Quantitative/Uganda</td>
<td>• Bridges the gap especially in rural areas.&lt;br&gt;• Improves financial transactions.&lt;br&gt;• Increases remittances with reduced costs (transport, time, etc.)&lt;br&gt;• Increases access on household welfare.&lt;br&gt;• Reduces poverty and vulnerability especially among the rural poor.</td>
<td>• Potentially inhibited by technology affordances and barriers to market information&lt;br&gt;• Mobile devices not designed with the peculiar needs of the rural poor in mind.&lt;br&gt;• Need to develop innovative educational interventions alongside.&lt;br&gt;• Phone and service quality to small holder farmers (lack of airtime, uncharged handset batteries, old phones and poor eyesight) &lt;br&gt;• Broader financial, material, infrastructural deficiencies&lt;br&gt;• Digital technology infrastructure deficiencies implicit</td>
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<tr>
<td>Wyche and Steinfield (2016)</td>
<td>M-Pesa</td>
<td>Qualitative/Kenya</td>
<td>• Has potential to increase financial inclusion.&lt;br&gt;• Has potential to increase productivity and efficiency of smallholder farmers?</td>
<td>• Benefits areas with poor or nonexistent physical infrastructure (fixed-line, internet access, etc.)&lt;br&gt;• Improves access to financial, agricultural, health, educational services, etc. and therefore livelihoods in remote areas.&lt;br&gt;• All income groups benefit from mobile money and transfers.&lt;br&gt;• Enhances social inclusion and economic development.&lt;br&gt;• An alternative to physical infrastructure for people in remote areas excluded from access to financial services.&lt;br&gt;• Alignment strategy between financial inclusion and financial integrity needed.</td>
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<tr>
<td>Motshobi and Graybowski (2017).</td>
<td>Mobile Money</td>
<td>Quantitative/Botswana, Cameroon, Ethiopia, Ghana, Kenya, Namibia, Nigeria, Rwanda, South Africa, Tanzania Uganda.</td>
<td>• Benefits areas with poor or non-existent physical infrastructure (fixed-line, internet access, etc.)&lt;br&gt;• Improves access to financial, agricultural, health, educational services, etc. and therefore livelihoods in remote areas.&lt;br&gt;• All income groups benefit from mobile money and transfers.&lt;br&gt;• Enhances social inclusion and economic development.&lt;br&gt;• An alternative to physical infrastructure for people in remote areas excluded from access to financial services.&lt;br&gt;• Separating oversight authority or regulator required to check high charges, service quality, exploitation etc.</td>
<td>• Potentially inhibited by technology affordances and barriers to market information&lt;br&gt;• Mobile devices not designed with the peculiar needs of the rural poor in mind.&lt;br&gt;• Need to develop innovative educational interventions alongside.&lt;br&gt;• Phone and service quality to small holder farmers (lack of airtime, uncharged handset batteries, old phones and poor eyesight) &lt;br&gt;• Broader financial, material, infrastructural deficiencies&lt;br&gt;• Digital technology infrastructure deficiencies implicit</td>
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<td>Elliot et al. (2018)</td>
<td>Mobile Money</td>
<td>Qualitative/Ghana</td>
<td>• Facilitates money transfers to increase financial inclusion.&lt;br&gt;• Creates networks of microfinance channel members&lt;br&gt;• Disseminates information and knowledge,&lt;br&gt;• Reduces transaction costs.&lt;br&gt;• Increases personalisation and localisation.&lt;br&gt;• Reduce power relationship</td>
<td>• Continues to be the most popular method of remittance&lt;br&gt;• Reduces transaction costs.</td>
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<td>Geng et al. (2018)</td>
<td>M-Pesa</td>
<td>Quantitative/Kenya</td>
<td>• Supports formal and informal health insurance for households.&lt;br&gt;• Increases health insurance cover for high-quality care at formal healthcare facilities.</td>
<td>• Implicitly limits ability to monitor and control the expenditure of mobile money recipients.</td>
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<td>Authors</td>
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<td>Lepoutré and Osabutey (2018)</td>
<td>M-Pesa and Mobile Money</td>
<td>Archival/Kenya, Nigeria</td>
<td>- Increases access to informal insurance (e.g., cash and back stock savings or gifts and social network remittances)</td>
<td>- Sensitivity of regulators to network externalities as well as constraints and capabilities of key stakeholders</td>
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<td>Bateman et al. (2019)</td>
<td>M-Pesa</td>
<td>Conceptual/Kenya</td>
<td>- Facilitates economic transactions.</td>
<td>- Governments and services providers in each country need to appreciate how differences in institutions and industrial conditions can influence adoption rates</td>
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<td>- Allows safer and faster peer-to-peer money transfers</td>
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<td>- Allows temporary storage of money and cashless payments.</td>
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<td>- Provided unparalleled access of financial services for unbanked.</td>
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<td>- Improves transactions.</td>
<td>- Key stakeholders not fully identified.</td>
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<td>- Poverty reduction</td>
<td>- Unclear whether the bulk of value creation goes to the poor.</td>
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<td>- Economic development</td>
<td>- Fintech may only create value for the narrow digital-financial elite.</td>
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<td>David-West et al. (2019)</td>
<td>Mobile Money</td>
<td>Case studies Gabon, Ghana, Kenya, Tanzania, Uganda, Zambia, Nigeria</td>
<td>- More affordable than similar services from traditional banks</td>
<td>- Innovation may enrich elites at the expense of the poor</td>
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<td>- Overcome some resource constraints at the bottom of the pyramid.</td>
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<td>- Reduce impact of institutional voids at the bottom of the pyramid</td>
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<td>- Frugal innovation at the intersection of social, technological and institutional innovation.</td>
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<td>Lashitew et al. (2019)</td>
<td>M-Pesa</td>
<td>Mixed methods/cross-country data and in-depth case analysis.</td>
<td>- Key role of the lead firm in guiding the innovation process</td>
<td>- Navigating between the competing goals of regulation – supporting innovation and fostering competition.</td>
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<td>- Supportive regulatory environment enhances financial inclusion.</td>
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<td>- Power/interest dynamics of key actors influences how an innovation addresses social issues.</td>
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<td>Onsongo (2019)</td>
<td>M-Pesa</td>
<td>Qualitative/Kenya</td>
<td>- MNEs can perform social innovation under institutional complexity and resource constraints.</td>
<td>- Navigating three types of institutional voids (market, policy and social)</td>
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<td>- MNEs can increase bottom line and social problems as CSR.</td>
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<td>- Key stakeholder (target users and policymakers) involvement to legitimise social innovation</td>
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<td>Batista and Vicente (2020)</td>
<td>mKesh</td>
<td>Quantitative (experimental)/Mozambique</td>
<td>- Increases savings by farmers,</td>
<td>- Farmers benefiting from specific savings</td>
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<td>- Increases farmers’ agricultural investment in fertilizer (by paying interest in the form of fertilizer)</td>
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<td>- Improves agricultural technology adoption and productivity.</td>
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<td>- Key role of the lead firm in guiding the innovation process</td>
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<td>- Power/interest dynamics of key actors influences how an innovation addresses social issues.</td>
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<td>N'dri and Kakinaka (2020)</td>
<td>Airtel Money, Orange Money, Mobicash</td>
<td>Quantitative/Baukina Faso</td>
<td>- Increases financial inclusion.</td>
<td>- Navigating three types of institutional voids (market, policy and social)</td>
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<td>- Enhances poverty alleviation.</td>
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<td>- Reduces nonmonetary poverty indicators such as nutrition, healthcare, education, etc.</td>
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<td>Senyo and Osabutey (2020)</td>
<td>Mobile Money</td>
<td>Quantitative/Ghana</td>
<td>- Performance and effort expectancy, behavioural intention and habit influences use,</td>
<td>- Policymakers need to work with service providers and intermediaries to ensure transparency to enhance trust.</td>
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<td>- Perceived risk influences people’s trust in agents and services.</td>
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<td>Tyce (2020)</td>
<td>M-Pesa</td>
<td>Conceptual/Kenya</td>
<td>- Increases innovative capabilities.</td>
<td>- Mobile telecommunications firms need incentives to extend services to remote rural and poor areas to realize financial inclusion to boost economic activities.</td>
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<td>- Influence market- or state-driven innovation.</td>
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<td>- Driving efficiencies in finance, agriculture, transport, education, etc.</td>
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<td>- Multiple pathways to innovation underexplored.</td>
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<td>- The effect of power relations between the state and the market with risk-taking rewar ded with regulatory-induced protection.</td>
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<td>- ‘Developmental patrimonialism’ political elite in the ownership structure and strategic direction.</td>
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<td>- Governments can support related social innovations to promote use.</td>
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<td>- ‘Developmental patrimonialism’ political elite in the ownership structure and strategic direction.</td>
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| | | | - Governments with limited resources and political capital may be better off building | (continued on next page)
transactions require substantial disclosure of personal details there are
subtle risks which call for an alignment between financial inclusion and
financial integrity. Notably, the legal framework to facilitate mobile
money transaction in various African countries evolved at a different
pace. For example, more recently, most governments have introduced
mandatory registration of SIM cards. A case in point is Ghana where
Coffie and Hongjiang (2023) observed slacks in the payment security
system led to mandatory SIM registration to prevent fraud and help trace
perpetrators. This would inevitably reduce privacy, however, in addition
to widening the tax net, governments can use the information to
increase surveillance over the activities of their citizens. To this extent
individuals may also be concerned about the disclosure of their infor-
mation to governments or other parties as they fear losing their privacy.
There are also emerging issues of identity theft and cybercrime that are
not being addressed by policy makers, with no deliberate steps being
taken across countries in Africa to find the right balance between
financial inclusion and financial integrity. In this regard, De Koker and
Jentzsch (2013) proffer that policymakers should monitor, support and
enforce privacy laws. In addition, where governments and policymakers
do not do enough to address such issues, NGOs and other agencies need
to step into this space to initiate general privacy education (De Koker
and Jentzsch, 2013). Meanwhile, Lashitew et al. (2019) suggest poli-

capacity in a handful of strategic
organizations
• The multiplying effect on stakeholders such as
customers, suppliers and women in formal
firms need attention in policy formulation.
• Need for deliberate policies that encourage
the diffusion of digital technologies,
especially to women entrepreneurs, to narrow
the gender gap.

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</tr>
</thead>
</table>
| Islam and Muzi (2022)    | Mobile Money      | Quantitative/16 Sub-Saharan African countries | • Expands financial inclusion (gender)  
• Augments better access and greater demand for credit by women-owned firms.  
• Increases investment by women-owned firms.  
• Improves customer and supplier credits. | capacity in a handful of strategic organizations  
• The multiplying effect on stakeholders such as customers, suppliers and women in formal firms need attention in policy formulation.  
• Need for deliberate policies that encourage the diffusion of digital technologies, especially to women entrepreneurs, to narrow the gender gap. |
| Balasubramanian et al. (2023) | Mobile Money | Quantitative/Kenya & Uganda | • Employment creation  
• Improve quality of life  
• Poverty reduction  
• Financial inclusion for the BoP (Bottom of the Pyramid) markets. | Effect poverty on operational decisions (inventory and price transparency)  
• Market dimensions (network density and demand).  
• BoP markets—agent network density and demand with related costs of carrying cash (risk of theft and loss)  
• Central banks and telecommunications regulators need to provide more incentives to agents serving BoP markets. |

3.2. Addressing resource and infrastructure constraints

The literature so far appears not to sufficiently address the resource and infrastructure deficits and constraints and how these inhibit securing the full potential benefits of mobile money to leverage the livelihoods of communities as well as serve as a catalyst for develop-
ment. Mothobi and Gzybowksi (2017) (see Table 1) suggest that infrastructure deficits reduce the full potential benefits of mobile money technology to the rural poor in Africa. Wyche and Steinfeld (2016) observe that the potential is also inhibited by technology affordances and barriers to market information. In some cases, smallholder farmers, for example, do not have access to good quality phones and the service quality in remote rural areas is poor. Some smallholder farmers and users lack or cannot afford airtime, they lack sufficient electricity to keep their phones charged and they sometimes have very old phones that are not compatible to gain the full benefits of fintech innovations. Consequently, broader financial, material, infrastructural deficiencies inhibit the potential benefits that could be derived.

This phenomenon is emphasised by David-West et al. (2019) that ‘bottom-of-the-pyramid’ customers, characterised by low income, low literacy, partial disconnection from the formal economy and critical development infrastructure face substantial resource constraints. There are significant literacy issues with some such actors whose grasp of formal/official languages such as English and French are limited. The majority of African populations, especially the rural poor, use indige-
nous African languages (Nyirenda-Jere and Biru, 2015). This language issue can limit the implementation and utilisation of digital content to benefit the rural poor. In a sense the markets in these rural areas are very small and this does not encourage providers to invest in infrastructure development. However, David-West et al. (2019) further argue that because technological innovations are capital- and scale-intensive and reliant on high-quality infrastructure and skilled labour it is sometimes deemed not profitable to deploy sufficient and quality service to such potential customers mostly found in the rural areas. Whilst governments may step in to support infrastructure development in rural areas, Tyce

The literature, therefore, appears to suggest the need for systems and

procedures that would ensure a good balance between regulation and
competition with tighter supervision and monitoring of service pro-
viders and agents. Such systems could identify and regulate cyber se-
curity, fraud, high charges, whilst at the same time minimising identity theft and privacy issues. These systems could also be supported by pri-
vacy and security risk education programmes, with policymaking
seeking to ensure an integrated balance between financial inclusion, integrity and security.
(2020) argues that governments themselves have limited resources and may need to consider using their political capital to build capacity in a handful of strategic organisations. In terms of ensuring financial inclusion through mobile money in remote rural areas, Senyo and Osabutey (2020) also suggest that mobile telecommunications firms need incentives from governments to extend services to remote rural and poor areas so that financial inclusion could boost economic activities and development. For example, government policy could seek ways of leveraging political capital to encourage the private sector to invest in rural infrastructure development.

Another important issue related to digitalisation, mobile money and financial inclusion is the fact that digital infrastructure has not been able to keep pace with the fast-growing demand. Infrastructural weaknesses are identified as a major barrier to digital entrepreneurship in the global South generally (Quinones et al., 2015; Damarillo, 2011), and infrastructure deficits contribute to disparities between developed and developing economies. The literature in this area suggests that this needs to be overcome for the promise of digital economies to be fully realised (Senyo et al., 2021). This is seen as an imperative due to other trends such as the growing urbanisation of developing countries’ populations (Marcus et al., 2015) and increasing data-intensity of economic processes (Greengard, 2010; Hilbert, 2016).

Further, infrastructural problems such as the lack of cost-effective, available, and reliable electricity in some parts of the world is a major obstacle to developing the digital economy (Kuek et al., 2015). Electricity is a key component of infrastructure needed to enable digitalisation and this is often deficient in Africa. A typical example is Nigeria’s inadequate electricity supply, which reportedly is hindering the government’s effort to digitalise the economy (GSMA, 2018; Ogunmodimu and Okorogwe, 2018). In addition, unreliable and fluctuating local power supplies hinder the ability to connect to local data centres and leads to data loss. Some mobile telecommunications companies are therefore pressured to install their own power supply, using diesel generators, to keep base stations/mobile towers operational. The operation of these generators comes at a significant cost to the industry, which inhibits the reach and efficiency of digitalisation (Greengard, 2010; GSMA, 2011).

In terms of telecommunications infrastructure, while there has been much progress in closing the digital divide there is still a considerable gap between developed and developing countries in terms of 3G and 4G cellular coverage (ITU, 2014). In rural areas of developing countries, 4G and even 3G network have been largely inaccessible (Okeleke and Stryjak, 2015), although this appears to be improving (GSMA, 2021). Yet the shift to higher network connectivity is costly to implement for operators that have little incentive to expand network coverage in areas with low population densities, electrical supply issues, fragile security situations and thus limited return on investment (Manyika et al., 2016).

Generally, there are quality and capacity issues for telecommunications infrastructure reflected in dropped calls, delays in text messaging, weak signals, and network overload (World Bank, 2014). Even where infrastructural challenges can be overcome, users must have the appropriate devices and applications with which to engage with or build local digital economies; yet this is often not the case. Many mobile phones are still only compatible with 2G network functionality, which provides little more than basic voice and text messaging services (Okeleke and Stryjak, 2015), with GSMA (2020) figures showing 59% of subscribers in sub-Saharan Africa using only 2G networks. Access to mobile internet and digital economy services requires 3G- and 4G-compatible devices, which requires widespread diffusion of smartphones. Mobile internet connectivity is stronger in some African countries than others; meaning certain populations have more penetration than others. Whilst countries such as Kenya and Nigeria have high mobile internet penetration, countries such as South Sudan are yet to make significant moves towards mass adoption of mobile internet (McCrocklin, 2019). Arguably, internet penetration is related to how government policies may be used to address the issue of resource and infrastructure constraints. As argued earlier, internet penetration varies across countries, and by extension, so would infrastructure. Indeed, Coulibaly (2021) compared countries in the West African Economic and Monetary Union (WAEMU) with East Africa with respect to mobile money penetration rates and asserted that similar determinants influence the adoption and use of mobile money accounts across both regions and conclude that the delay in penetration in WAEMU relative to East Africa may be attributed to insufficient policies for increasing awareness of the benefits of mobile money. This affirms similarity in infrastructure constraints albeit at different levels and rates. Therefore, the variable nature of internet penetration and infrastructure limits the expansion and application of digital technologies. Although telecommunication companies are collaborating with technology giants such as Facebook and Google to improve mobile access in Africa this has not satisfactorily closed the digital divide (Gouranga and Drine, 2020; Vinalkumar et al., 2020).

In addition, differences in adoption rates across Africa could be attributed to varying innovation ecosystems. For example, network externalities which intricately relate to infrastructure, enhanced mass adoption of mobile money introduction in Kenya relative to Nigeria due to different institutional and industrial conditions. However, with time Nigeria’s adoption rate was likely to increase. Arguably, power dynamics of key stakeholders in each country also influences adoption rates (Lepoutré and Oguntoye, 2018) and infrastructure development. Our review of these challenges of the introduction of mobile money and its ability to enhance financial inclusion (Table 1, and the wider literature on challenges of mobile technology in general that has implications for the provision of mobile money) suggests the need for policymakers and service providers to work together to address key physical infrastructure challenges relating to telecommunication coverage, weak signals and network overload. The inherent challenges of electricity supply in terms of coverage, fluctuations, and reliability that affects the provision of mobile money and its ability to reach wider and more isolated communities, would appear to need policy attention as it does not only adversely affect the telecommunication industry but entire economies. Although phone prices have reduced considerably over the last decade there appears to be a need to provide more affordable and up-to-date devices particularly for poorer users in order to enable the uptake of mobile money products. In this regard technology affordance related to costs of airtime and data and smartphones and 3G/4G compatibility issues would appear to need addressing to augment the benefits of mobile money and financial inclusion. There also appears a need for policymakers to give more focus to education and training on cybersecurity knowledge and expertise as continuing to ignore these may have detrimental effects on the ability of mobile money to sustainably improve financial inclusion.

### 3.3. Integrating stakeholder benefits

Recent studies by Coffie and Hongjiang (2023) note that the integral role of multiple actors to achieve financial inclusion has been under-explored. In their study they identify how stakeholders such as the government, telcos, mobile money agents, mobile money customers, and traditional banks work together to enhance financial inclusion. Earlier literature on the introduction of mobile money in Africa summarized in Table 1 also appears to suggest a major challenge, which has not been properly addressed, of integrating (or reconciling) the various needs of and benefits to the different stakeholders involved. This necessarily involves an understanding of the power relations among the various stakeholders. The power relations between the state and the market influence how risk-taking is rewarded with regulatory-induced protection especially where the political elite in some African countries are major shareholders. This is evident in ‘developmental paternalism’; characterised by deliberate investment in strategic industries by the political elite with the view of extracting generous future long-term dividends and pay-outs. Consequently, the
involvement of the political elite in the ownership structure dictates the strategic direction of some service providers across Africa (Tyce, 2020; see Table 1). Sensitivity of regulators to network externalities as well as constraints and capabilities of key stakeholders are important in achieving the best outcomes from mobile money innovations (Lepoutre and Oguntoye, 2018).

Bateman et al. (2019) ask a pertinent question about how stakeholder interests are addressed (Table 1). They evaluate the stakeholder configuration and note that it is worth questioning whether the bulk of value creation goes to the poor or enriches the narrow elite. Batista and Vicente (2020) argue that given the myriad and particular needs of the rural poor it is often a challenge to tailor the technology to meet specific requirements of smallholder farmers, for example. In this regard Tyce (2020) suggests that multiple pathways to innovation need to be explored. Arguably, there may be a need for mobile technology innovations that incorporates indigenous knowledge. This is an area mainly ignored by the extant literature on mobile money, even within the literature summarized in Table 1, which we selected based on its coverage of challenges. Although tangentially, there are references to arrangements in informal and community-based economic activity.

Hence De Koker and Jentzsch (2013) (Table 1) argue that governments need to develop a better understanding of customer choices between formal and informal financial services. For example, where mobile money penetration rate is relatively low N’dri and Kakinaka (2020) suggest that government initiatives are required. As indicated earlier, the rural poor appears to be disadvantaged in gaining sufficiently from fintech innovations. Osei-Assibey (2015) suggests encouraging more savings among low-income earners. Yet Wyche and Steinfield (2016) note that in most cases mobile devices were not designed with the needs of the rural poor in mind. In addition, the ability of the rural poor to utilise the technologies have not been fully appreciated. This calls for a need to develop innovative educational interventions. This means that the sustainability of financial inclusion initiatives requires multifaceted approaches (De Koker and Jentzsch, 2013). For the diffusion of emerging appropriate mobile technologies to be efficient, more efforts also appear to be needed towards ensuring that innovations are tailored to the particular needs of users to make them sustainable (Lashitew et al., 2019). Senyo and Osabutey (2020) suggest that governments can support related social innovations to promote use. For example, purchase of inputs supplied by government and payments of outputs from smallholder farmers could be made via mobile money to encourage its use.

Hence, Elliot et al. (2018) recommends making mobile technologies more customer-oriented. To address this Onsongo (2019) identifies three types of institutional voids (market, social and policy) which need to be navigated: market voids, where commercial banks were not recognizing ‘bottom-of-the-pyramid’ as a target market; social voids, for example through disruption to social networks through migration to cities for work and the need to send remittances back to relatives in rural areas; and, where for example mobile phone operators had to overcome a lack of legislative provision for them to offer financial services.

Onsongo (2019) also suggests a need for more deliberate strategies aimed at incorporating hitherto excluded social groups into some form of formal economic activities with the aim of achieving financial inclusion that increases profitability of service users and alleviates poverty at the same time (that is, utilising the ‘bottom-of-the-pyramid’ concept as a commercially driven development strategy: Prahalad and Hart, 2002). In addition, the lack of relevant regulations or guidelines suitable for mobile money creates a policy void which is exacerbated by the challenges of synchronising banking and telecommunications (Asongu et al., 2021; Mogaji and Nguyen, 2022).

The literature reviewed above, and summarized in Table 1, suggests that to integrate stakeholder benefits the power relations between the state and the market, which often complicate how competition and market forces operate, needs attention. It suggests a need to move away from developmental patrimonialism where the political elite dictate strategic direction and influence policymakers and regulators, and towards a stakeholder-driven regulatory framework that can ensure the provision of value for mobile money products and services to consumers. Such a framework could create value for all users with particular emphasis on those at the bottom-of-the-pyramid. Financial institutions, telecommunication service providers and consumer and community groups could work together to achieve a more equitable distribution of benefits to stakeholders while establishing a more obvious connection to financial inclusion. Government initiatives to encourage more savings and use across income groups also appear to be important and NGOs, civil societies and government agencies could cooperate to provide education programmes for less technologically-literate and sceptical users.

Fig. 1 brings together these main challenges and areas to be addressed as an integrated framework and headed under the three themes of ‘ensuring integrity, privacy and security’, ‘addressing resource and infrastructure constraints’ and ‘integrating stakeholder benefits’.

4. Integrating stakeholder benefits through building innovation systems

Our literature-derived framework suggests that these challenges are connected to each other and that policymakers would need to address these interconnectedly. This could be undertaken by building institutions and innovation systems (Fig. 1). Distinct institutions which separately or collectively contribute to the development and diffusion of new technologies are termed ‘innovation systems’ (Lundvall, 1992; Metcalfe, 1995).

Although it is difficult to address these issues one-by-one in building innovative systems, the overriding imperative appears to be the need to balance and ultimately integrate often competing stakeholders’ interests. It is concerning, for example, that local socio-cultural factors including indigenous knowledge and technology that may reflect community interests appear often to be overlooked in managing technology transfer from the global north to south. Clearly there are issues of economic and political power relations that impact on this. To an extent this could be addressed by the careful balancing of protective regulations and competition, yet this would require government initiatives to provide incentives for technical and social innovation such as ensuring provision in remote areas that may be unattractive to mobile phone providers, as well as working with civil society in promoting appropriate digital education among communities along with up-to-date mobile technology.

New mobile and digital technologies could augment indigenous knowledge and innovation systems, but can also work against them. Jackson (2013) emphasises the need to depart from the modernising mentality that simply regards indigenous knowledge and technologies as outdated. Indigenous technology and knowledge reflect the dynamic way in which a group or community have developed and understood ways of organising themselves to enhance their lives in the context of their environment, culture and history (Iwowo, 2015). Therefore, knowledge creation and utilisation in the African context should incorporate rather than marginalise indigenous voices and local interests (Jackson, 2013). Hence, to achieve sustainable technology utilisation the participation of indigenous stakeholders from the design stages onwards should be seen as important. According to Osabutey and Croucher (2018), African countries need to develop institutional capabilities that are stakeholder-driven to address technology transfer and utilisation issues. The understanding of how innovation systems and indigenous knowledge interact appears to be crucial to the success of the implementation of new technologies.

Arguably, North-South technology and knowledge transfer has been fraught with issues of inappropriate fit between foreign and local approaches (Fu et al., 2011). Osabutey and Jackson (2019) have argued that South-South technology and knowledge transfer may provide a closer fit. In much the same way Africa-Africa technology and knowledge transfer would allow the technologies created, adopted or adapted...
and used in some African countries to influence the choices of other African countries. Countries like Kenya, being pacesetters of fintech innovations in Africa, have developed more advanced systems (Tyce, 2020). Experiences and applications of emerging mobile technologies and their applications in an exemplar country in Africa could be more easily transferred to other Africa countries. Although there is a paucity of literature that highlights innovation in Africa and potential Africa-to-Africa technology and knowledge transfer, anecdotally there are emerging African innovations that could be adapted in similar countries with comparable institutions and indeed related problems (see for example: venturesafrica, 2021). Both the private and public sectors could benefit from intra-Africa technology and knowledge transfer when evaluating the use of mobile technologies for business or development. Although there are significant differences in market structure and social context among local areas, countries and regions in Africa, cross-national learning may benefit the building of appropriate innovation systems in these different milieus. Unfortunately, research in this area is currently lacking.
The potential to more rapidly utilise similar technologies and innovation to address related needs more efficiently could be quite high. An example of this would be learning from both the positive and negative aspects of the integration of mobile money technology with community initiatives such as rotating savings and credit associations (ROSCAs) where some success has been reported in Tanzania and Uganda (Ky et al., 2018), and problems reported of declining use of ROSCAs in Ghana when mobile money is introduced (Cornelius, 2019). More widely, with South-South learning, issues have been reported in India that informal credit networks suffered when they were exposed to formal institutional microcredit (Banerjee et al., 2021). Such examples may suggest the need to address the power relations involved between multinational and community stakeholders, and for a better understanding of the needs of the latter. There is therefore the potential to learn both from examples in different African countries and other regions of the global South, and analysis of interactions with indigenous technologies.

This is particularly relevant as the structure and organisation of innovation systems in Africa do not always allow efficient adoption and utilisation of new technologies (Osabutey and Croucher, 2018). This sometimes leads to poor integration of foreign technologies with indigenous technologies which results in the total neglect or under-utilisation of indigenous sources of technology and knowledge (Lall and Pietrobelli, 2005; Adomako et al., 2020). Innovation systems play an important role in how indigenous knowledge, technology and innovation interact. The power-interest dynamics of key actors in the innovation system can shape the inclusive innovations that aim to address social issues. This means that the development and diffusion of mobile money innovations in developing countries need to be analysed by evaluating the appropriateness of the technologies (Lashitew et al., 2019). Service providers need to use such technologies to complement social innovations to operate under conditions of institutional complexity and resource constraints (Onsongo, 2019). In this regard Osabutey and Croucher (2018) suggest that systems of innovation in Africa are inhibited by institutional voids, as we discussed above. To this end whether or not institutional arrangements are a result of formal or informal sector activities, they are intertwined with indigenous knowledge, technology, and innovation. However, Onsongo (2019) proposes that success in settings with significant institutional voids depends on appealing to the needs of target users (market), engaging with policymakers, and redefining meanings of both incumbent and new technologies. This suggests that policy makers need to create regulations within institutional arrangements that operate at the interface between enterprise profitability and market-driven poverty alleviation. Such arrangements, within the ‘bottom-of-the-pyramid’ concept, not only may alter community-based institutions such as ROSCAs that have traditionally offered financial support and credit within the local community, but as Bateman et al. (2019) point out, may extract value for external shareholders that could have been used within the local community. Hence careful regulation that is sensitive to indigenous knowledge and the needs of the poor may be appropriate.

The evaluation of indigenous knowledge also calls for a closer look at the informal economy. This is because the informal economy in Africa contributes substantially to employment and skills development (Bernards, 2017; Bonnet et al., 2019: ILO, 2018). Most workers in Africa rely on the informal economy, which depends predominantly on indigenous knowledge, for which reason the role of this knowledge cannot be ignored. Jackson (2012) notes that the prevalence of foreign technology in the formal sector is not reflected in the informal sector and that the latter has followed its own trajectory in the adoption of new technologies. Consequently, there is the need for developing the skills base of informal firms to allow greater assimilation and utilisation of new technologies (Jackson, 2012; Osabutey and Croucher, 2018).

Existing literature suggests that educational levels of much of the rural population engaged in the informal economy in Africa are low (Jogwa, 2010). Yet this assertion to a large degree ignores the value of indigenous knowledge. The educational systems in Africa, in most cases, appear somewhat removed from the developmental challenges of indigenous local communities. African indigenous technology and knowledge systems have not been integrated into educational systems to make them relevant. Therefore, community-based knowledge production has developed in isolation from the formal educational systems (Kaya and Seletti, 2013). This means that adopting, adapting, and utilising imported technologies could be challenging if disconnected from indigenous knowledge. These challenges are often exacerbated when individuals lack technical skills such as basic electronic processing knowledge needed to use such technologies (Toffo, 2018). Inequalities in the access to mobile phones and related networks, often referred to as the digital divide (Van Dijk, 2006), and issues related to the affordability of airtime also provide constraints on the integration of imported technologies such as mobile money with indigenous and community-based arrangements. These infrastructure and resource constraints limit technology development and innovation in Africa, and these have implications for technology transfer (Osabutey et al., 2014).

In seeking to return to our framework in Fig. 1, institutions and innovation systems need to address power relations, often by introducing regulations that help to manage the balance between poverty alleviation and profit making within the bottom-of-the-pyramid concept, which balances stakeholder interests particularly by incorporating indigenous knowledge and technology, and sharing South-South and Africa-Africa learning, by providing proper access to technology and digital education, led by government initiatives or through the agency of NGOs and other civil society organisations. Hence technology transfer, with the introduction of mobile money in Africa as a prime example, has to be managed in a proactive and sensitive way, and often this cannot be left to the more powerful stakeholders. Bateman et al. (2019), for example are critical of the claim that the introduction of mobile money technology to local communities provides direct benefits to local enterprise and hence contributes to reducing poverty, aiming their criticisms particularly at the assertion made by Suri and Jack (2016) in an influential article in Science that cites the apparent success of M-Pesa in Kenya.

Far from providing financial resources, through the loan facilities of M-Shwari accessible to M-Pesa customers, to enable women to move out of subsistence agriculture and set up micro-enterprises they contend that most such enterprises result in failure. Increases in enterprise redistribute local demand among a larger number of traders resulting in many failures of new entrants. Any benefits appear to be negated by this high level of enterprise failure, while exposing new enterprise entrants to higher levels of debt (Bateman et al., 2019). Where new entrants have a degree of success this may also displace present micro-enterprises thus disrupting already successful enterprises (that may not have had access to mobile money) by spreading out local demand among many more micro-enterprises, losing jobs and incomes to present incumbents. This may therefore cancel out any benefits from increased access to finance, where supply increases but demand does not. Hence any increase in entrepreneurial activity with a rise in competition through better access to finance through mobile money seems to place additional strain. This appears to have the effect of reducing living standards across the community, also exacerbated by rising levels of debt. Over-indebtedness within communities in the global South with increased access to micro-credit, often facilitated by interventions from the international development community, is well documented (Gatens et al., 2015). Hence the claim that mobile money can lift millions of social individuals, particularly women, out of poverty by providing the financial resources to set up micro-enterprises may be erroneous. Finance and indebtedness may simply be diverted from informal and community-based institutions such as ROSCAs, to formal, global financial institutions. As well as extracting financial resources out of the community, mobile money and its access to credit facilities may also be disrupting community social relations by not taking sufficient cognisance of indigenous knowledge. This may be connected to the power relations implicit within the
bottom-of-the-pyramid concept which appears to endorse the process of resource extraction from the poor, as a route to economic development (Peredo et al., 2018). Prahalad and Hart (2002) introduced the bottom-of-the-pyramid concept into the academic literature as an approach where multinational enterprises could access large potential markets (the poor, the informal economy) and at the same time alleviate poverty, instead of providing direct aid via development assistance to poor communities such as those in Africa. This has gained traction in development circles. Despite the issues, the ensuing literature mostly appears supportive rather than critical of the power relations this may develop.

5. Discussion and conclusion

The aim of this study was to critically review existing research on mobile money as a prominent example of digitalisation and fintech innovations in Africa, which is purported to enhance financial inclusion and hence to contribute to poverty alleviation. We sought to identify both benefits and challenges identified in the literature and their implications, to inform policy making, business practice and future research. The emerging themes that we have identified from the literature suggest that ensuring integrity, privacy and security; addressing resource and infrastructure constraints; and integrating stakeholder benefits are the main challenges facing the evolution of mobile money innovation in Africa.

To enhance innovation there needs to be a balance of power relations between the state and the market (Tyce, 2020). Policy makers need to strive towards assessing the required balance between financial inclusion, integrity and security. This necessitates physical infrastructure development particularly in rural areas (Mothobi and Grzybowski, 2017). In addition, issues related to technology affordances and barriers to market information (Wyche and Steinfield, 2016) where so-called bottom-of-the-pyramid consumers experience more resource constraints (David-West et al., 2019; Balasubramanian et al., 2023) require policy attention. Market forces do not encourage service providers to develop and aim financial digital products at poorer communities, its supposed success may be far from the reality. To only serve the needs of better-off members of communities, the political elites and distance external shareholders (Bateman et al., 2019). There is the need to support the private sector to address the resource and infrastructure constraints to leverage the benefits across a wider stakeholder group. It is evident that all these themes are linked and so policymaking should focus on the emerging themes related to integrity, privacy and security whilst at the same time supporting the private sector to address the resource and infrastructure constraints to leverage the benefits across a wider stakeholder group. It is evident that all these themes are linked and so policymaking should focus on the emerging themes related to integrity, privacy and security whilst at the same time supporting the private sector to address the resource and infrastructure constraints to leverage the benefits across a wider stakeholder group. 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Integration, privacy and security issues can be addressed through appropriate regulation. Resource constraints can be addressed in partnerships between governments and commercial interests, and with NGOs and government to address education constraints. It would be more difficult to integrate stakeholder benefits, where this involves power imbalances.

Logically, where a particular stakeholder does not derive sufficient benefit from the introduction of mobile money, they can of course withdraw. Yet despite the intentions of bottom-of-the-pyramid thinking to sell a product to the poorest communities to contribute to development, in the case of mobile money it is the strata above the poorest that are the stakeholders. The poorest, because of educational levels, not being able to afford smartphones, not having access to 3G or 4G, are not currently included and cannot be considered stakeholders. Left to market forces they will not be included. Also, evidence that mobile money and credit are disruptive to local communities’ financial arrangement, may make mobile money inappropriate and undesirable, if more of the poorest are brought within the ambit of ‘stakeholder’.

This study contributes to the mobile money-financial inclusion literature in Africa by identifying both benefits and challenges. Our framework uniquely brings together interrelated key challenges and required policies to emphasise how building requisite institutions and innovations systems could address these. Theoretically, our study accentuates a more nuanced mobile money-financial inclusion nexus to suggest that understanding varying stakeholder needs are crucial and that despite some differences between African countries there exists sufficient similarities to necessitate Africa-Africa learning. Our framework also highlights the complex multi-faceted connections between factors that would reduce challenges to enhance benefits from mobile money as a Fintech innovation. In particular, this enables us to more fully understand the challenges in the context of development policy and interventions with a view to the relevant stakeholders. There is a clear case for more research to be undertaken on the interaction between exogenous mobile money and other fintech innovations, and endogenous arrangements such as ROSCAs, particularly comparing urban and rural communities.

Existing literature has not sufficiently evaluated the key stakeholders and key beneficiaries. There is also limited literature on who are the real beneficiaries of fintech (mobile money) usage? The extent to which it benefits the urban middle class relative to the rural poor in remote areas needs some attention. Particular attention to the concept of bottom-of-the-pyramid is necessary. Whilst fintech appears to be the new panacea for poverty alleviation and local development the emerging challenges have been underexplored. The appropriateness of these technologies has not been sufficiently evaluated. How institutions influence technology development and innovation systems in Africa is an urgent area of enquiry. In addition, how new technologies interact with institutions, innovation systems and indigenous technology and knowledge needs more scrutiny. The literature also does not explore how digital technologies are stimulating innovation and business development in Africa. Although there are some individual and SMEs developing and utilising digital innovations in Africa the literature has not given sufficient attention to these. Related studies on digital innovation and intra-Africa technology and knowledge transfer are needed. A study that shows how a particular technology or innovation in one African country worked or failed in another will reveal compelling information for entrepreneurs and policymakers.

CRediT authorship contribution statement

Ellis L.C. Osabutey: Conceptualization, Writing – original draft, Writing – review & editing. Terence Jackson: Conceptualization, Writing – original draft, Writing – review & editing.

Data availability

No data was used for the research described in the article.

References


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