

Overcoming Financial Barriers for SMEs and Startups in the DRC: Leveraging Digital Financial Services for an Effective Entrepreneurial Ecosystem

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Abstract

Digital technologies, in particular mobile money platforms, have made a significant contribution to economic growth in Sub Saharan Africa (SSA) by improving productivity, employment, and investment. However, access to these technologies is uneven across and within countries, affecting the ability of businesses to use them effectively. Despite the growth of mobile money, small and medium enterprises (SMEs) and startups in the Democratic Republic of Congo (DRC) face significant obstacles in accessing finance, hindering their development and the country’s economic prosperity. This chapter aims to assess the impact of digital financial services (DFS) on SME development in DRC, focusing on how these technologies can improve access to finance and foster entrepreneurship, uses a mixed effects to capture the random, fixed variations of the model combined with structural equation modeling (SEM), allows to analyze direct relationships between variables and examine interrelationships within the entrepreneurial ecosystem. The study fills a gap in the literature about the role of DFS in stimulating entrepreneurship in Central Africa, particularly in the DRC, provides information for policymakers and financial institutions to develop strategies that improve SMEs access to finance. The findings underline the importance of creating a favorable socio-economic and political environment to maximize the benefits of digital financial services, policymakers and financial institutions can leverage mobile money and crowdfunding to support SME growth, and thus stimulate economic development in the DRC.

Keywords

Digital Financial Services (DFS), Mobile Money, Democratic Republic of the Congo (DRC), Crowdfunding, Entrepreneurship

1. Introduction

Adopting digital technologies stimulates productivity, employment, investment, fosters growth and development, Africa has already benefited from the rapid spread of information and communication technologies, characterized by the widespread adoption of mobile phones. However, access to digital technologies and their use by businesses is uneven across the region, and varies not only between countries but also within them (Cruz, 2024).

Naghavi (2022) underlined that the mobile money industry has seen significant global expansion over the years, in 2012, Sub-Saharan Africa (SSA) dominated the sector, accounting for 84 percent of all active accounts within a 30-day period.

Demirguc-Kunt et al. (2022), drawing on empirical evidence and supporting technology adoption theory, have demonstrated the widespread penetration of mobile phones across Africa, with mobile money accounts emerging as a formal borrowing platform in some sub-Saharan African economies.

The mobile internet landscape in Africa varies significantly, the mobile internet penetration levels are over 50% in Mauritius, South Africa and the Seychelles, but still below 15% in Benin, Chad and the Democratic Republic of Congo (GSMA, 2023).

The Global Findex 2021 survey had, for the first time, included questions on formal borrowing through mobile money accounts, and data from the survey indicated that 3% of adult's worldwide report borrowing through their mobile money accounts, with a slightly higher rate of 7% in SSA region (Demirguc-Kunt et al., 2022).

The intensive use of cell phones is illustrated by the significant transactional activity facilitated by leading mobile money platforms such as M-Pesa, Airtel Money and Orange Money.

These platforms are key mechanisms for solving the persistent problem of financial exclusion (Ntara, 2015; Mas & Radcliffe, 2010a; Kendall et al., 2011), academic research into the performance of venture capital and private equity in SSA affirms the transformative capacity of mobile-based financial solutions to alleviate the accessibility problems, faced by small and medium-sized enterprises (SMEs) in obtaining finance (Mashamba & Gani, 2023).

In addition, academic discourse on SMEs financing in Africa highlights the importance of diverse financing channels, including mobile platforms, in encouraging entrepreneurial efforts across the continent (Froumentin & Boyera, 2011; Ukpere et al., 2014; Dahi & Enweruzo, 2024; Sanga & Aziakpono, 2024; Sawitri, 2023).

Empirical evidence underscores the pivotal role of SMEs as drivers of economic growth and employment generation, particularly in developing nations (Mulungula et al., 2023).

Several studies corroborate that challenges in accessing financing constitute the primary barrier to SME advancement in SSA, these obstacles are further exacerbated by issues such as corruption, inadequate infrastructure, and limited innovation (Kareli et al., 2023; Amoako-Adu & Eshun, 2018).

The effectiveness of digital financial services initiatives does not depend solely on market dynamics and entrepreneurial incentives, on the contrary, it is closely linked to the broader socio-economic and political environment in which they operate (Mader et al., 2022).

Understanding these contextual factors is essential, to assess the success and impact of mobile money in promoting SMEs development and economic prosperity in DRC.

DRC, the largest country by surface area in Sub-Saharan Africa and with a population estimated at 109 million (World Bank, 2024), a population growth rate of over 3%, and urbanization is also on the rise, with almost 40% of the population living in urban areas (Di Castri, 2014; Twite & Balume, 2023).

Hiller (2017) confirmed that the rise of mobile payments and internet access in Africa has enabled crowdfunding to fill the early-stage funding gap for small businesses, tapping into global funding communities for substantial financial support.

Crowdfunding in Central Africa, and the DRC is still in its infancy, faces opportunities and challenges, the growing popularity of digital and mobile finance in the region, coupled with a long cultural heritage of community support, presents favorable conditions for the adoption of crowdfunding (Chao et al., 2020).

Despite the increasing body of literature on mobile money and crowdfunding, their effects on entrepreneurship, there remains a paucity of research addressing the capacity of these financing methods to stimulate entrepreneurship in DRC.

This paper aims to fill this gap by analyzing whether the adoption of digital financial services, such as mobile money and crowdfunding, can improve SMEs access to finance, in this context of SMEs or start-ups struggling to access capital in the early stages of their activity. The research question can be formulated as follows to explore the subject further: What are the main obstacles preventing SMEs and start-ups in the DRC from accessing adequate capital in the early stages of business creation?

The study examines factors such as infrastructure, bank interest rates, political instability, human capital, culture, startup capital, growth capital, debt, financial support, market access and technological equipment.

These elements are examined to provide valuable information to policymakers, financial institutions and entrepreneurial support entities striving to foster inclusive economic progress in the DRC.

The study extends further by exploring the factors for creating an ecosystem conducive to entrepreneurship and crowdfunding, relying on mobile money services as a fundamental element and based on the theoretical framework of studies (Stam & van de Ven, 2021; Avarmaa et al., 2022; Alaassar et al., 2022).

To achieve our objective, we have combined mixed and structural equation models (SEM) computed in Stata.

Mixed-effects regression allows us to capture average effects and context-specific variation, consistent with the financial inclusion theory (Access-Use-Quality framework) and regional disparities in DFS adoption.

SEM enables the modelling of latent variables, integrating concepts from the digital ecosystem and institutional theory to capture the complex interdependencies between access to finance and entrepreneurship.

The combination of the two methods allows for a robust assessment of the observable and unobservable factors that influence SME growth, consistent with the conceptual framework.

The paper is organized as follows: Section 2 provides a review of literature focusing on digital financial services, the efficacy of financial options facilitated by mobile money, and ecosystem processes. Sections 3 and 4 present the data collection, empirical methodologies and the findings. Finally, Section 5 concludes the paper by summarizing key insights and discussing their policy implications.

2. Literature Review

The landscape of finance is undergoing a profound transformation, marked by the emergence of digital financial services (DFS) as a contemporary alternative financing mechanism, [Abbasi & Weigand \(2017\)](#) underscore the transformative potential of DFS, which leverages innovative technologies such as Internet banking, mobile-phone-enabled solutions, electronic money models, and digital payment platforms to extend traditional banking services to customers.

Mobile money and crowdfunding demonstrate not only their growing role in improving financial inclusion in Africa, but also the complex ecosystem and institutional dynamics that shape their adoption.

To structure and deepen this understanding, three theoretical frameworks are particularly relevant to the phenomena observed: the access-use-quality framework of financial inclusion, the digital ecosystem framework, and institutional theory.

The literature consistently highlights that DFS broaden access to financial services, particularly for disadvantaged groups, [Gabor & Brooks \(2019\)](#) corroborate this perspective, emphasizing the significant capacity of DFS to broaden the delivery of basic financial services to the public, particularly underserved populations, in an affordable, convenient, and secure manner.

[Rana et al., \(2019\)](#) underline that the DFS have great potential to offer several reasonable, appropriate and secure banking services to disadvantaged people in developing countries, thanks to pioneering technologies such as mobile phone-based solutions, digital platforms and e-money models.

Furthermore, [Bachas et al., \(2018\)](#) highlight the potential of DFS, including ATMsp, debit cards, mobile money, and digital credit, to mitigate transaction costs, thereby enhancing financial accessibility and efficiency. This assertion aligns with the high growth and penetration rates of mobile telephony in Africa, which are catalyzing the transformation of cell phones into portable banks.

[Asongu \(2013\)](#) elucidates that this transformation presents unprecedented opportunities for African countries to expand access to affordable and cost-effective financial services, thereby fostering financial inclusion, contributing to poverty

reduction and sustained economic growth.

Such advancements in DFS are of paramount importance not only to financial institutions, microfinance institutions but also to governments, financial regulators, and development partners (Danladi et al., 2023).

The Access, Usage, and Quality framework, rooted in financial inclusion theory, provides a robust structure for analyzing how DFS and crowdfunding expand access, improve usage rates, and enhance service quality for underserved populations in Africa.

This framework is supported by the literature, which highlights that while access to DFS has increased, actual usage and service quality remain critical challenges, particularly for marginalized groups such as women and youth.

Empirical studies also reveal that improved access does not automatically translate into increased use or improved quality, particularly for marginalized populations such as women and young people (Figuet et al., 2022).

These observations are consistent with the AUQ framework, which argues that financial inclusion requires simultaneous progress in access, usage, and quality.

Applying the AUQ framework to the DRC context helps explain why, despite the rapid expansion of mobile telephony (Aker & Mbiti, 2010) and the regulation of electronic money (Catri, 2014), the transformative impact of digital financial services on SMEs remains uneven.

Variations in network reliability, agent liquidity, and consumer protection shape the actual experience of digital financial services, thereby influencing their adoption by entrepreneurs.

The AUQ framework, therefore, provides a conceptual explanation for the gaps identified in the literature between potential inclusion and actual inclusion, and offers a basis for assessing how digital financial services and crowdfunding can support SME financing.

The AUQ (Access-Use-Quality) framework conceptualizes financial inclusion as a multidimensional construct in which each component exerts a distinct influence on entrepreneurial outcomes.

Drawing on the literature on financial development and entrepreneurship, this study formulates the following hypotheses:

H1: Greater access to financial services, measured through mobile money, access to financing, availability of financing, infrastructure, and market access, is positively associated with the number of entrepreneurs.

H2: Higher levels of financial use, measured by start-up capital, growth capital, and crowdfunding, have a positive influence on the number of entrepreneurs.

H3: Lower quality financial services, reflected in high bank interest rates and high debt levels, are negatively correlated with entrepreneurial activity.

The Diffusion of innovations theory, inspired by Rogers (2003), explains how new technologies and financial innovations spread and are adopted. This theory is particularly relevant for understanding the adoption of DFS and crowdfunding platforms in Africa, highlighting factors such as perceived ease of use, relative ad-

vantage, and compatibility with existing practices.

The literature confirms that the rapid growth of mobile telephony and digital payment platforms has catalyzed the transformation of cell phones into portable banks, making DFS and crowdfunding more accessible and convenient for a broader population

The economists have realized that higher rates of adoption of modern technologies can accelerate the development process (Jack & Suri, 2011), but without access to finance, SMEs cannot develop, create jobs and drive growth.

While the literature documents the expansion of digital technologies, it also highlights major structural constraints that hinder the adoption of digital financial services, such as limited access to electricity, low banking penetration, and weak financial infrastructure.

These constraints highlight the necessity of analyzing digital financial services within the broader digital ecosystem, encompassing infrastructure, supportive policies, market structure, and digital culture.

SSA has low levels of infrastructure investment compared to global standards, approximately 29% of roads are paved and access to electricity is limited to merely a quarter of the population, with alternative transportation options being scarce. However, there has been a remarkable surge in the adoption and utilization of mobile telephony across the region in recent years (Aker & Mbiti, 2010).

Quaye et al., (2014) estimate that up to 84% of SMEs in Africa are underserved, representing a value gap in credit financing of USD 140 - 170 billion.

Runde et al., (2021) estimate that only 20% - 33% of SMEs in Sub-Saharan Africa have access to bank loans or lines of credit, with 28.3% subject to total credit constraints, high interest rates, often more than 20% - 25% at banks and as high as 40% - 50% at alternative lenders, compound the problem.

Bonini & Capizzi (2019) underline that their main role in the economy is to fill the primary funding gap, there is a need to create a favorable ecosystem for entrepreneurship, combining crowdfunding and mobile money services to bridge the primary financing gap in Central Africa, particularly in DRC.

Mollick (2014) defines crowdfunding as an attempt by an entrepreneur, individuals, and groups, that are culturally, socially, or profitably oriented, to finance investment projects through the Internet, who give small contributions, without standard financial intermediaries.

Horvatinović & Orsag (2018) argue that crowdfunding is used by SMEs that are still developing, which means that it will be used in stages from the time of company creation to the maturity phase.

Collins & Pierraks (2012) confirm that companies use crowdfunding after they have exhausted the resources provided by FFF (friends, family, and folks), and in the development period when the company is not attractive enough to venture capital funds and after business angels have ceased to be active.

To address the fundraising issues faced by SMEs and start-ups, many entrepreneurs have resorted to crowdfunding as an alternative source of equity or debt

financing (Kit, 2021).

Cai (2018) argues that crowdfunding is part of two major innovations (crowdfunding and blockchain) that are attempting to disrupt, disintermediate financial transactions and gives further indications of the FinTech revolution to come.

Mobile money, as described by Aron (2017), is a recent innovation offering financial transaction services through mobile phones, including to the unbanked global poor. Mobile phones have become essential for simplifying access to financial services, helping more unbanked individuals join the financial system.

Kedir & Kouame (2022) highlight the proliferation of emerging financial technologies, such mobile money platforms, emphasizing the need to examine the accessibility, the ramifications of these innovations among low-income populations, and marginalized social cohorts, including women and youth across Africa, and the fact that mobile money is seen as a substantial catalyst for development, ostensibly improving critical issues related to financial inclusion.

Empirical findings indicate the existence of a sustained relationship between digital finance and financial inclusion in both nations with substantial savings and those with more modest saving capacities over the long term (Bede Uzoma et al., 2020).

Financial technology (FinTech), exemplified by mobile money accounts and transactions, is widely regarded as a significant driver of development due to its capacity to address fundamental challenges related to financial access (Kedir & Kouame, 2022).

Empirical findings illustrating the effectiveness of mobile money in solving financial inclusion challenges, in tandem with the emergence of community financial services, mobile financial services swiftly gained traction across the African continent (Bawuah, 2023; Aker & Mbiti, 2010).

The development of digital transactions and mobile payments has transformed the financial landscape in developing countries, making it easier for many people to access basic financial services.

Since the success story of M-PESA in Kenya in 2007, mobile money has emerged in developing countries as the most effective way to provide (poor) households with access to financial services, and to modernize financial transactions in context of a strong preference for cash (Apeti et al., 2023).

Safaricom initiated the mobile money platform M-Pesa in Kenya in 2007, with “M” denoting mobile and “Pesa” representing money in Swahili. M-Pesa has since emerged as a prominent exemplar of mobile money evolution. Subsequently, Tanzania and Uganda followed suit, embracing M-Pesa after its successful implementation in Kenya (Sharma & Díaz Andrade, 2023).

The advent of mobile money has the potential to revolutionize the landscape of financial inclusion. While conventional models of financial inclusion have predominantly operated within the dichotomy of credit-led or savings-led approaches, the experience of M-PESA indicates the emergence of a novel paradigm a focus on establishing robust payment infrastructure as the foundational framework

upon which a comprehensive array of financial services can be built (Mas & Radcliffe, 2010b).

As discussed earlier, mobile money services, particularly M-PESA, have demonstrated significant success in facilitating fast and cost-effective financial transactions, particularly in rural areas (Jussila, 2015).

Additionally, M-PESA has been identified as a sustainable and innovative financial instrument for small and medium-sized enterprises (SMEs) operating in underdeveloped financial markets, particularly in sub-Saharan Africa. Combined with microfinance, crowdfunding is presented in the literature as a promising alternative financing mechanism that can ease credit constraints for underserved business (Marom, 2013).

As MFIs, P2P lending and crowdfunding platforms have matured, their emphasis has shifted towards addressing the financial needs of marginalized demographics, with a particular focus on empowering women in developing economies (Gomber et al., 2018).

Building on these elements, Matanji (2019) demonstrates that the spread of mobile money reinforces this potential by supporting mobile-based crowdfunding models and expanding the reach of financial services. Mobile money platforms such as M-PESA and communication apps such as WhatsApp are increasingly serving as channels for resource mobilization, collective investment, and community fundraising, thereby promoting financial inclusion and local economic development.

Many empirical findings from the literature illustrate the effects of a rapidly growing yet unevenly distributed digital ecosystem.

This explains why the impact of digital financial services on entrepreneurship is stronger in certain countries, such as Kenya in East Africa, and weaker in others, such as those in Central Africa, clarifies why the Democratic Republic of the Congo (DRC), despite the rapid growth of mobile money, still lacks an integrated digital entrepreneurial ecosystem.

The existing literature consistently highlights the dual influence of formal and informal institutions on the adoption and effectiveness of digital financial services (DFS) in emerging markets.

Formal institutions, such as regulatory frameworks, governance structures, and financial sector supervision, play a central role in shaping the landscape of financial innovation.

In December 2011, the Central Bank of Congo (BCC) released a sound regulatory framework for electronic money (e-money) that allows non-banks to set up a subsidiary to provide e-money services (Catri, 2014).

In 2018, a landmark of 1200 M-Pesa transactions per second was recorded, presently, Vodafone extends M-Pesa services predominantly across Asia and Africa, focusing on developing nations such as the Democratic Republic of Congo (Bregu et al., 2019).

Kamba-Kibatshi (2018) confirms that the financial systems of Sub-Saharan Af-

rican countries, including the Democratic Republic of Congo, are shallow and poorly developed. They rely mainly on a weak and concentrated banking sector, offering mostly short-term financing.

The banking sector faces a profound challenge with a penetration rate of less than 4%, contrasting starkly with the rapid expansion of the telecommunications infrastructure (Aluko & Ajayi, 2018).

This disparity in growth can be attributed to several impediments hindering the establishment of a robust and functional financial sector, including the notably sparse population density of 29.3 individuals per square kilometer in sub-Saharan Africa’s largest country by land area (Aluko & Ajayi, 2018).

At the same time, informal institutions, including cultural norms, trust, and social networks, significantly influence the dynamics of informal crowdfunding, community financing, and collective use of mobile money for savings and group contributions (Matanji, 2019; Collins & Pierrakis, 2012).

Institutional theory further explains regional variations in the adoption of digital financial services across Africa, positing that stronger governance, clearer financial regulation, and favorable social norms are associated with greater and more sustainable adoption of digital financial services (North, 1990).

In the Democratic Republic of Congo, persistent institutional weaknesses, including shallow financial markets, fragmented regulatory oversight, and a cultural preference for cash, partly explain why mobile money penetration remains high but its integration into SME financing mechanisms remains limited (Catri, 2014).

An entrepreneurial ecosystem consists of a network of interdependent actors and factors that are managed to facilitate productive entrepreneurship within a specific region (Leendertse et al., 2022).

As highlight by Stam & & van de Ven (2021), the pillars of ecosystem must have ten important keys: resources such as human capital, finance and services, along with the involvement of actors like talents, investors, mentors, advisors, and peer entrepreneurs, the role of formal institutions (governmental and regulatory frameworks), informal institutions (cultural support), and access to domestic and foreign markets.

Cicchiello (2019) confirms that the ecosystems, which are crucial for productive entrepreneurship, are influenced by a range of factors, including public policy, regulatory frameworks, and interactions among ecosystem actors.

The digital entrepreneurship ecosystem, as part of the broader entrepreneurship ecosystem, plays a crucial role in fostering entrepreneurial activity by providing various elements such as skills development through business mentoring networks, ecosystem support infrastructure like gas pedals, incubators, innovation centers, and co-working spaces, and facilitating access to markets and finance including seed, venture, and growth capital (Gomes & Lopes, 2023).

This ecosystem leverages digital technologies and platforms to create and trade digital artifacts, offering new opportunities for entrepreneurs to innovate and compete in the digital economy (Allen, 2019).

Additionally, the digital ecosystem intertwines with the digital business models

and digital platforms, enabling entrepreneurs to explore new ventures, engage in open innovation, and utilize crowdfunding platforms for financing projects (Bernardino et al., 2023).

While the AUQ dimensions capture direct effects, both the digital ecosystem framework and institutional theory emphasize that financial inclusion outcomes depend on broader environmental and institutional conditions.

By integrating knowledge from the AUQ framework, the digital ecosystem perspective, and institutional theory, this study proposes the following hypotheses:

H4: A more developed digital ecosystem, including robust infrastructure, higher levels of human capital, expanded market access, and stronger institutional support, amplifies the positive impact of digital financial services (DFS) on entrepreneurship.

H5: Better-quality formal institutions, including effective governance, transparency, and regulatory stability, positively moderate the relationship between the availability of DFS and entrepreneurial activity.

H6: Favorable informal institutions, such as cultural norms supportive of entrepreneurship, trust-based social networks, and strong traditions of community financing, increase the likelihood that entrepreneurs will adopt and benefit from DFS.

These hypotheses reflect the assumption that the effects of DFS are not uniform across regions, but rather depend on the strength of digital infrastructure, the quality of regulation, and sociocultural conditions.

The literature reviewed highlights that entrepreneurial outcomes in developing economies are influenced not only by financial inclusion, but also by the broader digital and institutional environment in which entrepreneurs operate.

Based on these observations, **Table 1** summarize the main theoretical foundations, namely the access-use-quality (AUQ) framework, the digital ecosystem perspective, and institutional theory, and maps them to the hypotheses and concepts used in this study.

Table 1. Hypotheses, frameworks and references.

Hypothesis	Theory	Variables	Expected Effect	References
H1	Financial Inclusion (Access)	Mobile Money, Access_financing, Finance, Infrastructure, Market_access	Positive (+)	Bachas et al. (2018); Demircuc-Kunt et al. (2022)
H2	Financial Inclusion (Use)	Startup_capital, Growth_capital, Crowdfunding	Positive (+)	Collins & Pierrakis (2012); Chao et al. (2020); Hiller (2017)
H3	Financial Inclusion (Quality)	Bank_interest_rates, High_debt	Negative (-)	Runde et al. (2021); Muravyev et al. (2009)
H4	Digital Ecosystem	Infrastructure, Human Capital, Market Access, Institutional Support	Moderating (+)	Gomes & Lopes (2023); Acs et al. (2017); Leendertse et al. (2022)
H5	Institutional Theory (Formal Institutions)	Governance, Regulatory Support, Transparency	Moderating (+)	Castri (2014); Kareli et al. (2023); Mader et al. (2022)
H6	Institutional Theory (Informal Institutions)	Culture, Community Financing, Financial Support	Moderating (+)	Mollick (2014); Chao et al. (2020); Leendertse et al. (2022)

Source: Authors.

Table 1 clarifies how each hypothesis draws on established theoretical and empirical research, links variables to specific dimensions of financial inclusion and ecosystem dynamics and describes the expected directional effects.

The following section describes the methodological approach used to empirically examine these relationships, details the data sources, operationalization of variables, and analytical strategies employed, including mixed-effects models and structural equation modeling (SEM).

This approach allows for the systematic testing of both the direct effects proposed in the AUQ-based hypotheses and the moderating influences derived from digital ecosystem and institutional theory.

By aligning the empirical design with the conceptual framework developed in the literature review, the methodology ensures consistency between theory, hypotheses, and analysis.

3. Methodology

We use a hypothetico-deductive method, starting with concepts drawn from the literature, examining relevant theories, formulating hypotheses and concluding with tests designed to disprove or confirm these hypotheses (Siponen & Klauvuniemi, 2020; Eysenck, 1950).

The data comes from mapping carried out in 2019 by the Competitive Industries and Innovation Programme (CIIP), active from 2014 to March 2022.

The CIIP was a multi-donor initiative backed by key international partners, including the World Bank, the European Union (EU), the Organization of African, Caribbean and Pacific States (OACPS), and the governments of Austria, Switzerland, and Norway, on a unique database of 2374 formal and informal MSMEs in DRC for the four cities (Kinshasa, Lubumbashi, Goma and Matadi).

Our study is based on a sample of 595 SMEs and start-ups who responded online, to assess the difficulties encountered in accessing capital and building an ecosystem conducive to entrepreneurship.

The challenges identified in the Congolese context enabled us to construct variables for analyzing the entrepreneurial ecosystem.

These variables encompass several key dimensions for Governance (political instability, corruption, and bureaucracy), Finance (bank interest rates, access to start-up capital, and growth capital), Culture (under-resourced environments, lack of workspace, and limited mentoring opportunities), Infrastructure (energy and electricity availability), Support (access to training programs), Market Access (low demand, high competition, and restricted market accessibility), Human Capital (business skills, technical skills, and the prevalence of unskilled labor).

Additionally, we introduced two proxy variables crowdfunding through financial support and mobile phone usage as an indicator of technological equipment.

These variables were selected due to their credibility, recognition in the specific context of the Congolese entrepreneurial ecosystem and presented in **Table 2** description of variable. Furthermore, their inclusion facilitates comparison with pre-

vious studies that have employed similar conceptual frameworks (Acs et al., 2017; Muravyev et al., 2009; Leendertse et al., 2022; Stam & van de Ven, 2021).

Table 2. Variables description.

Variables	Definition & measure	Source
Total_Entrepreneurs	Total number of individuals involved in setting up or running a business. Leendertse et al. (2022)	The Competitive Industries and Innovation Programme (CIIP).
Bank_interest_rates	Indicators of entrepreneurs perception of the difficulty of obtaining loans at competitive rates: High_Bank_interest_rates = 1 if bank interest rates are high, represents the percentage of observations where bank interest rates are considered high High bank interest rates = 0 if bank interest rates are not high, this percentage represents cases where interest rates are not high (Muravyev et al., 2009)	The Competitive Industries and Innovation Programme (CIIP).
Startup_capital	Percentage of entrepreneurs that have succeeded in raising funds to start their activities, in our study, Startup_capital = 1 if startup capital is available to entrepreneurs. Startup_capital = 0 if startup capital is not available to entrepreneurs.	The Competitive Industries and Innovation Programme (CIIP).
Growth_capital:	Success rate in raising finance for growth projects, and Growth_capital = 1 if growth capital is available to entrepreneurs. Growth_capital = 0 if growth capital is not available to entrepreneurs.	The Competitive Industries and Innovation Programme (CIIP).
High_debt:	Ratio of total debt to company assets or revenues, High_debt = 1 if the debt level is high. High_debt = 0 if the debt level is not high.	The Competitive Industries and Innovation Programme (CIIP).
Financial support proxy variable of Crowdfunding	Ability to raise funds through family and community contributions, this refers to the extent to which entrepreneurs can secure financial support from their immediate social network, including family members, friends, and the broader community. (Chao et al., 2020; Hiller, 2017)	The Competitive Industries and Innovation Programme (CIIP).
Mobil money	Access for entrepreneurs to the modern technologies they need to develop their businesses, such as broadband internet, advanced software and technological equipment. Technological equipment indicators proxies for Mobile Money. Hiller (2017) Demircuc-Kunt et al., (2022)	The Competitive Industries and Innovation Programme (CIIP).
Access_financing	Ability of entrepreneurs or businesses to obtain the funds they need to finance their activities. Access_financing = 1 if access to financing is available, Access_financing = 0 if access to financing is not available. (Kareli et al., 2023; Amoako-Adu & Eshun, 2018)	The Competitive Industries and Innovation Programme (CIIP).
Governance	The quality of public institutions, transparency, corruption and political stability all affect the business climate.) (Kareli et al., 2023; Amoako-Adu & Eshun, 2018; Mader et al., 2022)	The Competitive Industries and Innovation Programme (CIIP).
Finance	Availability of sources of finance (banks, investors, microfinance) for entrepreneurs. (Acs et al., 2017; Leendertse et al., 2022; Stam & van de Ven, 2021)	The Competitive Industries and Innovation Programme (CIIP).
Culture	Social norms and attitudes towards entrepreneurship, such as risk tolerance, valuing innovation and entrepreneurial success. (Chao et al., 2020; Leendertse et al., 2022; Stam & van de Ven, 2021)	The Competitive Industries and Innovation Programme (CIIP).

Continued

Infrastructure	Access to the physical and technological infrastructure needed for business development, such as roads, telecommunications and public services. (Kareli et al., 2023; Acs et al., 2017; Leendertse et al., 2022; Stam & van de Ven, 2021)	The Competitive Industries and Innovation Programme (CIIP).
Support	Level of government or institutional support for entrepreneurs, including business development programmes, subsidies and favourable policies. (Acs et al., 2017; Leendertse et al., 2022; Stam & van de Ven, 2021)	The Competitive Industries and Innovation Programme (CIIP).
Market access	Easier for entrepreneurs to enter markets and reach their target customers, both locally and internationally. (Acs et al., 2017; Leendertse et al., 2022; Stam & van de Ven, 2021)	The Competitive Industries and Innovation Programme (CIIP).
Human Capital	Human capital includes intangibles like education and experience, while knowledge includes science and technology. (Leendertse et al., 2022; Stam & van de Ven, 2021)	The Competitive Industries and Innovation Programme (CIIP).

Source: Authors.

The paper employs mixed methods and structural equation modeling (SEM) to examine the relationships between entrepreneurial ecosystem variables and growth. Additionally, statistical tests were used to assess the significance of each variable, capturing both direct relationships and context-specific effects.

We calculated the following econometric models for the entire sample:

1) Mixed model:

$$\begin{aligned} \text{Access_financing}_{ij} = & \beta_0 + \beta_1 \text{bank interest rate} + \beta_2 \text{Startup capital} \\ & + \beta_3 \text{Growth capital} + \beta_4 \text{High Debt} + \beta_5 \text{Sme_Type} \quad (1) \\ & + u_j + \varepsilon_{ij} \end{aligned}$$

$$\begin{aligned} \text{Access_financing}_{ij} = & \beta_0 + \beta_1 \text{bank interest rate} + \beta_2 \text{Startup capital} \\ & + \beta_3 \text{Growth capital} + \beta_4 \text{High Debt} + \beta_5 \text{Sme_Type} \quad (2) \\ & + \beta_6 - \beta_{11} (\text{Control variables}) + u_j + \varepsilon_{ij} \end{aligned}$$

where:

- ❖ $(\beta_0 + \beta_1 \text{ bank interest rate} + \beta_2 \text{ Startup capital} + \beta_3 \text{ Growth capital} + \beta_4 \text{ High Debt} + \beta_5 \text{ Sme_Type} + \beta_6 - \beta_{11} (\text{Control variables}))$ explain the Fixed Effect, represent the average effect of explanatory variables (such as High bank interest rate, Startup capital, Growth capital, High Debt and SmeType) on the dependent variable Access financing across all observed units.
- ❖ u_j explains Random effects capture variations specific to each location and allow the forecasts to be adjusted for the unique unobserved characteristics of the locations, and ε_{ij} captures errors or random variations not explained by fixed effects or random effects.

2) Structural equation models (SEM):

SEM consists of two parts: the measurement model specifies the relationships between the latent variables and the observed variables, and the structural model describes the relationships between the latent variables and the causal effects between them.

We have two latent variables: Access to finance and Entrepreneurial ecosystem,

and the following observed variables: Governance, Financial Support, Human Capital and Technological Equipment.

The models were used and specified as follows:

$$\begin{aligned} \text{Access_financing}_{ij} = & \beta_0 + \beta_1 \text{bank interest rate} + \beta_2 \text{Startup capital} \\ & + \beta_3 \text{Growth capital} + \beta_4 \text{High Debt} + \beta_5 \text{Sme_Type} \quad (1) \\ & + \beta_6 - \beta_{11} (\text{Control variables}) + \varepsilon_1 \end{aligned}$$

$$\begin{aligned} \text{Total_Entrepreneurs}_{ij} = & \alpha + \beta_{12} \cdot \text{Access_financing} \\ & + \beta_{13} \text{Total_Entrepreneurs}_{t-t} + \varepsilon_2 \quad (2) \end{aligned}$$

where:

- ❖ B_n represents the strength and direction of relationships between variables, indicates the change in the dependent variable for a one-unit change in the predictor variable, holding other variables constant.
- ❖ ε_n represents the error terms.
- ❖ Total entrepreneurs as the total number of news firms or entrepreneurs (Leendertse et al., 2022).

The mixed and the structural model helped us to translate the conceptualized relationships into testable hypotheses and understand the underlying relationships between the variables observed, based on **Table 2**.

4. Findings and Discussions

As shown on **Table 3**, out of the total respondents, 161 firms (27.06%) are headed by women, while 434 firms (72.94%) are headed by men, indicate a significant male dominance in leadership positions within these SMEs.

Table 3. Frequency of 595 entrepreneurs.

Variable	Frequency	Percentage
Genre		
Women	161	27.06%
Men	434	72.94%
Education		
Commerce	16	2.69%
Primaire	2	0.34%
Secondaire	46	7.73%
Niveau graduat	130	21.85%
Niveau licence	393	66.05%
Niveau master	8	1.34%
Employees		
1 to 10	495	83.19%
11 to 50	92	15.46%
51 to 200	8	1.34%

Continued

Annual turnover		
Medium: >80,000 USD	38	6.39%
Micro: <10,000 USD	384	64.54%
Small: 10,000 à 80,000 USD	173	29.07%
Location		
Goma	139	23.36%
Kinshasa	310	52.10%
Lubumbashi	103	17.31%
Matadi	43	7.23%

Source: Authors.

The education levels of the owner-managers, 66.05% hold a level license, 21.85% have completed level graduate, and smaller proportions hold a level master (1.34%), “Secondaire” (7.73%), “Primaire” (0.34%), or a “Commerce” education (2.69%), suggests that a substantial majority have at least a business-oriented diploma or certificate, accounting for 36% of all respondents.

The SMEs vary significantly, with the majority (83.19%) employing between 1 to 10 employees, 15.46% employing between 11 to 50 employees, and only a small fraction (1.34%) having 51 to 200 employees.

The financial scale of these SMEs shows that 64.54% are categorized as micro enterprises with an annual turnover of less than 10,000 USD, 29.07% are small enterprises with turnovers between 10,000 and 80,000 USD, and only 6.39% are medium enterprises with turnovers exceeding 80,000 USD, and the location of the SMEs shows that a majority are based in Kinshasa (52.10%), followed by Goma (23.36%), Lubumbashi (17.31%), and Matadi (7.23%).

Table 4. Summary statistics of variables.

Variable	Obs	Mean	Std.dev	Min	Max
Access financing	595	0.7782	0.4158	0	1
Governance	595	0.4454	0.6236	0	2
Finance	595	1.1882	0.5640	0	3
Culture	595	0.5210	0.5067	0	2
Infrastructure	595	0.2845	0.4516	0	1
Support	595	0.1582	0.3653	0	1
Market access	595	1.0807	0.9321	0	3
Human Capital	595	0.5630	0.7480	0	3
Financial support	595	0.6857	0.4646	0	1
Technological equipment	595	0.6739	0.4692	0	1

Notes: This table presents Summary statistics of dependents variables, these variables are further described, with sources of data indicated, in **Table 2**.

As shown on **Table 4**, Access to finance is relatively good for most entrepreneurs observed with a mean of 0.778, the standard deviation of 0.416 shows some variation, most entrepreneurs don't have access to finance above 0.5, all entrepreneurs are either without access to finance (0) or with access (1), with no intermediate values.

For governance, a mean of 0.445 below 0.5 suggests that governance is relatively weak in general, with a high standard deviation of 0.624 indicating a wide variation, with some entities having weak governance and others higher and the scores range from 0 to 2, showing that poor governance (0), moderate governance (1), and good governance (2).

The mean score of Finance is high at 1.188, suggesting that most entrepreneurs have good financial capabilities, with a moderate standard deviation of 0.564, indicating that most entrepreneurs are around the average, and financial scores range from 0 to 4, illustrating no access (0), limited access (1), some access (2), good access (3), excellent access (4).

The mean of Culture is 0.521, around 0.5, indicating a moderate cultural presence, with a moderate standard deviation of 0.507, suggesting that most entrepreneurs are around the average, and scores range from 0 to 2, showing no significant barriers (0), moderate barriers (1) and significant barriers (2).

The score for Infrastructure is low at 0.285, which may indicate a lack of adequate infrastructure in most entities, the standard deviation of 0.452 shows some variation, but some entrepreneurs have minimal infrastructure. The infrastructure score ranges from 0 to 2, indicating that some entities have almost no infrastructure, poor (0), average (1) and good (2).

For support, the mean is 0.158, very low, indicating almost no support for most entrepreneurs, with the standard deviation of 0.365 showing that a few entrepreneurs have some support, but this is rare. As with infrastructure, the support score is either non-existent or present, but at a minimal level, no support (0), and support (1).

A mean score of 1.0811 for market access is above 1, indicating good market access for most entrepreneurs, with a high standard deviation of 0.932, suggesting a large variability in market access among entities. Market access varies widely, from Low (0) to very high (3), showing significant disparities.

A mean score of 0.563 is slightly above 0.5, indicating that human capital is moderately developed, the high standard deviation of 0.748 suggests a wide range in the quality or quantity of human capital available. The scores range from Low (0) to very high (3), reflecting large differences in human capital levels.

A mean score of financial support is close to 0.7, suggesting that many entities receive moderate financial support (family, friends and folks). The standard deviation of 0.465 shows that most entities are around the mean. The score ranges from no support (0) to support FFF (1), suggesting that financial support is either non-existent or present at a constant level.

A moderate mean score of 0.674, indicates that most entities have some level of

technological equipment, the standard deviation of 0.469 shows moderate variation, with some entities having technological equipment, and the scores range from 0 to 1, indicating that some entities have no technological equipment.

The results show that the variables financial support, technological equipment and market access have the highest means, suggesting that entrepreneurs have good access to financial resources and markets, Governance and Human Capital have moderate means, but with high variability, indicating significant disparities between entities.

Infrastructure, Support, and Technological Equipment have low scores on average, suggesting areas where entrepreneurs often have difficulties.

As shown the **Figure 1**, the correlation coefficients vary between -1 and 1 where 1 indicates a perfect positive correlation, -1 a perfect negative correlation and 0 indicates no correlation, the strong correlations between the variables between technological equipment and access financing, coefficient of 0.5692 (p -value = 0.0000), we find a strong positive correlation between access financing and technological equipment, suggesting that entrepreneurs with good access to finance also tend to have better Technological equipment.

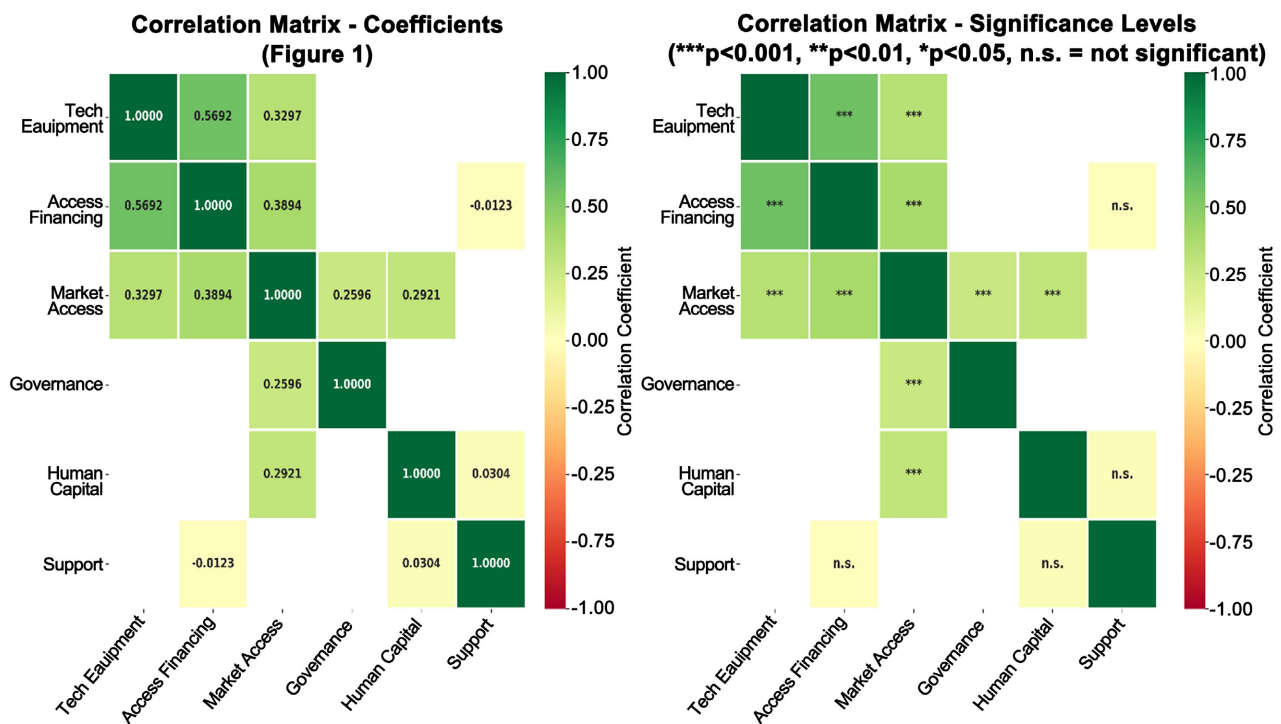


Figure 1. Correlation matrix. Source: Authors.

Similarly, the variables technological equipment and market access have a coefficient of 0.3297 (p -value = 0.0000), show that better market access is strongly associated with better technological equipment.

The variables Market access and Access financing have a coefficient of 0.3894 (p -value = 0.0000), show a moderate positive correlation between market access

and access to finance, indicating that these two aspects are related. The moderate correlations are between the variables Market access and Governance, the coefficient is 0.2596 (p -value = 0.0000), good governance is moderately associated with better market access, and the variables human capital and market access have a coefficient of 0.2921 (p -value = 0.0000).

Finally, the weak or non-significant correlations, the variables support, and access financing have a coefficient of -0.0123 (p -value = 0.7643), no significant correlation between support and access financing, financial support and human capital have a coefficient of 0.0304 (p -value = 0.4585), and the correlation between financial support and human capital is very weak and not significant.

To examine the relationships between accessing finance variables and Finance variables, first we used the mixed models, firstly we built a model based on location, Goma as the reference and on type SME: Medium_sme, Micro_sme, and Small_sme.

As shown in **Table 5** and **Table 6**, Bank interest rates show a strong and highly significant negative effect on access to financing.

Table 5. Mixed modes model 1 & 2.

Variables	Model 1			Model 2		
	Access financing			Access financing		
Bank Interest rates	-0.7825*** (0.000)	-0.7824*** (0.000)	-0.7826*** (0.000)	-0.4980*** (0.000)	-0.4976*** (0.000)	-0.4979*** (0.000)
Start-up Capital	0.1609*** (0.000)	0.1617*** (0.000)	0.1600*** (0.000)	0.0638** (0.033)	0.0646** (0.028)	0.0623** (0.034)
Growth Capital	0.1220*** (0.000)	0.1225*** (0.002)	0.1217*** (0.003)	0.01807 (0.610)	0.01849 (0.602)	0.01729 (0.627)
High Debt	0.0891** (0.000)	0.0885** (0.054)	0.0898** (0.051)	0.0427 (0.260)	0.0419 (0.272)	0.0437 (0.253)
Financial support				0.1045*** (0.001)	0.1051*** (0.001)	0.1045*** (0.001)
Technological equipment				0.3697*** (0.000)	0.3694*** (0.000)	0.3696*** (0.000)
Location						
Kinshasa	0.1303*** (0.001)	0.1303*** (0.001)	0.1301*** (0.001)	0.1248*** (0.000)	0.1288*** (0.000)	0.1247*** (0.000)
Lubumbashi	0.0774 (0.130)	0.0775 (0.130)	0.0772 (0.130)	0.0962** (0.030)	0.0964** (0.029)	0.0961** (0.030)
Matadi	-0.5103*** (0.000)	-0.5099*** (0.000)	-0.5107*** (0.000)	-0.3258*** (0.000)	-0.3252*** (0.000)	-0.3265*** (0.000)
Type Sme						

Continued

Medium	-0.0003 (0.997)		0.1167 (0.825)			
Micro	-0.0003 (0.918)		-0.0089 (0.731)			
Small			-0.0056 (0.866)		-0.0018 (0.950)	
Wald	1569.21 (0.0000)	1566.88 (0.0000)	1566.88 (0.0000)	1794.18 (0.0000)	1827.34 (0.0000)	1807.19 (0.0000)
N	594	594	594	594	594	594

Notes: This table reports the mixed regression results for the access financing issues in DRC using two simple models. The dependent variable is Access financing. The explanatory variables are: High bank Interest rates, start-up capital and growth capital. capital, high debt, financial support, technological equipment, location and type of sme. > |z|-statistics in parentheses **p* < 0.05; ***p* < 0.01; ****p* < 0.001.

Table 6. Mixed modes model 3.

Variables	Model 3		
	Access financing		
Bank Interest rates	-0.3890*** (0.000)	-0.3852*** (0.000)	-0.3890*** (0.000)
Start up Capital	0.0138 (0.635)	0.0159 (0.573)	0.0138 (0.635)
Growth Capital	-0.01890 (0.586)	-0.01782 (0.607)	-0.01890 (0.586)
High Debt	0.2323 (0.532)	0.2123 (0.569)	0.2323 (0.532)
Financial support	0.1390*** (0.000)	0.1390*** (0.000)	0.1392*** (0.000)
Technological equipment	0.3406*** (0.000)	0.3392*** (0.000)	0.3406*** (0.000)
Governance	-0.4843*** (0.021)	-0.4824*** (0.021)	-0.4843*** (0.021)
Culture	0.0806** (0.005)	0.08350** (0.005)	0.0806** (0.005)
Infrastructure	0.0355 (0.214)	0.03634 (0.202)	0.0355 (0.214)
Support	0.0740* (0.078)	0.0696 (0.098)	0.07395* (0.078)
Market access	0.5318*** (0.000)	0.5368*** (0.000)	0.5319*** (0.000)

Continued

Human Capital	0.8451*** (0.000)	0.8450*** (0.000)	0.8451*** (0.000)
Location			
Kinshasa	0.1150*** (0.000)	0.1154*** (0.000)	0.1150*** (0.000)
Lubumbashi	0.0754* (0.074)	0.0760* (0.072)	0.0754* (0.074)
Matadi	-0.2487*** (0.000)	-0.2457*** (0.000)	-0.2486*** (0.000)
Type Sme			
Medium	0.0365 (0.467)		
Micro		-0.02808 (0.291)	
Small			0.03644 (0.467)
Wald	1802.51 (0.0000)	1795.64 (0.0000)	1840.05 (0.0000)
N	592	592	592

Notes: This table reports the mixed regression results for the access financing issues in DRC using two simple model. The dependent variable is Access financing. The explanatory variables are: High bank Interest rates, start-up capital, growth capital, high debt, Governance, finance, culture, infrastructure, support, market access, human capital, financial support.

This finding is fully aligned with hypothesis (3), which posits that poor quality financial services (high cost of borrowing) suppress SME financing capacity, this result also is in line with existing literature where interest rates exceed affordability thresholds, entrepreneurs are systematically excluded from credit markets (Runde et al., 2021), and in DRC, high interest rates remain a structural barrier, validating the AUQ framework (quality dimension).

Startup Capital shows a positive and statistically significant effect in most models, although the effect weakens once ecosystem controls are added.

Growth capital is significant in early models but becomes statistically insignificant when broader ecosystem variables are included.

This partially supports hypothesis (2), which argues that financial use, actual availability and mobilization of funds should enhance access to new financing.

High debt shows a positive but inconsistent relationship, significant only in model 1 and not in model 2 or 3, indicates that once ecosystem and institutional controls are added, debt levels no longer explain access to financing.

This weakness supports hypothesis (3), debt levels matter less than interest rates; entrepreneurs may access credit despite high leverage if alternative financing channels exist.

Financial support, as a proxy for crowdfunding, and technological equipment, as a proxy for mobile money added in model 2, have a positive significant relationship with access to finance, highly significant, highlighting the importance of crowdfunding and mobile money support.

These findings support hypothesis (1): Access to DFS improves entrepreneur’s ability to obtain financing, and hypothesis (2): Use of alternative financing channels increase access, the results are in line with findings from Demirguc-Kunt et al., (2022) and Chao et al., (2020).

The impact of location is mixed between the different cities, in Kinshasa, is positive significant in both models, Lubumbashi is not significant in model 1 but becomes significant in model 2, and Matadi is negative significant in both models.

Location is a significant determinant, with Kinshasa offering better access than Matadi, which systematically shows a negative relationship, and the coefficients for the different types of SME (medium, micro, and small) are generally not significant, suggesting that Type Sme may not have a significant effect on access to finance in this study.

By adding control variables based on the ecosystem entrepreneurial system, the Governance, proxy variable of the formal institution (−0.4843) is a significant negative relationship between governance and access to financing, implying poor governance may increase the financing issues.

Secondly, to examine the relationships between entrepreneurial ecosystem variables and total entrepreneurs, we used the SEM models.

H1: *Greater access to financial services, measured through mobile money, access to financing, availability of financing, infrastructure, and market access, is positively associated with the number of entrepreneurs.*

Our findings confirm this hypothesis in a nuanced way. In the SEM model in Table 7 and Figure 2, access to finance has a significant negative direct effect on the total number of entrepreneurs ($\beta = -0.2169, p < 0.10$), contrary to initial expectations. However, examining the components of access reveals differential effects:

Table 7. SEM model 4.

Variables	Direct effects	Indirect effects	Total effects
Access Financing -> Total Entrepreneurs	-0.2169* (0.088)		-0.2169* (0.088)
Bank Interest rates -> Access Financing		-3.2735*** (0.001)	-3.2735*** (0.001)
Start up Capital-> Access Financing		0.1209 (0.691)	0.1209 (0.691)

Continued

Growth Capital-> Access Financing	-0.0022 (0.949)	-0.0022 (0.949)
High debt-> Access Financing	-0.01178 (0.771)	-0.01178 (0.771)
Governance -> Access Financing	-0.0456** (0.033)	-0.0456** (0.033)
Culture -> Access Financing	0.1116 (0.000)	0.1116 (0.000)
Infrastructure -> Access Financing	0.4112 (0.156)	0.4112 (0.156)
Support -> Access Financing	0.1106*** (0.006)	0.1106*** (0.006)
Market access -> Access Financing	0.0643*** (0.000)	0.0643*** (0.000)
Human capital -> Access Financing	0.08785*** (0.000)	0.08785*** (0.000)
Financial support -> Access Financing	0.1657*** (0.000)	0.1657*** (0.000)
Technological equipment -> Access Financing	0.3746*** (0.000)	0.3746*** (0.000)
Constant		0.2306 (0.000)
LR test		23.485 (0.024)
RMSEA		0.040 (0.000)
AIC		7585.988
BIC		7660.508
CFI		0.968
TLI		0.933
SRMR		0.020
CD		0.454
N	592	592

Notes: This table reports the mixed regression results for the access financing issues in DRC using two simple models. The dependent variable is Access financing. The explanatory variables are: High bank Interest rates, start-up capital, growth capital, high debt, financial support, technological equipment, location and type of sme. > |z|-statistics in parentheses * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Market access significantly improves access to finance ($\beta = 0.0643$, $p < 0.001$), confirming that connectivity to broader markets improves financial accessibility.

Mobile money (Technological equipment) has the strongest positive effect ($\beta = 0.3746$, $p < 0.001$), confirming that digital financial services reduces barriers to access.

Infrastructure, while theoretically important, has no significant direct effect ($\beta = 0.4112$, $p > 0.10$), suggesting that physical infrastructure may be less critical than digital infrastructure in this context.

The unexpected negative coefficient for access to finance relative to the total number of entrepreneurs suggest that simply having access does not guarantee use, a central distinction in the AUQ framework.

This finding emphasizes that access is necessary but insufficient without corresponding modes of usage (H2).

H2: Higher levels of financial use, measured by start-up capital, growth capital, and crowdfunding, have a positive influence on the number of entrepreneurs.

Contrary to expectations, our results only partially support this hypothesis: Start-up capital has positive but insignificant effects in all models ($\beta = 0.1209$ in the SEM, $p > 0.10$; $\beta = 0.0138$ in model 3, $p > 0.10$), Growth capital is also insignificant ($\beta = -0.0022$ in the SEM, $p > 0.10$).

However, financial support (crowdfunding) appears to be consistently significant ($\beta = 0.1657$, $p < 0.001$ in the SEM; $\beta = 0.1390$, $p < 0.001$ in model 3).

These results suggest that the type of financing matters more than the amount.

Crowdfunding, as a funding mechanism, is effective, perhaps because it combines financing with market validation and testing (Mollick, 2014).

Traditional measures of capital may not reflect actual deployment patterns, or entrepreneurs in the DRC may face constraints in converting capital into productive ventures due to ecosystem limitations (related to H4).

H3: Lower quality financial services, reflected in high bank interest rates and high debt levels, are negatively correlated with entrepreneurial activity. This hypothesis is strongly supported by empirical evidence:

Bank interest rates consistently have significant negative effects in all models ($\beta = -3.2735$, $p < 0.001$; $\beta = -0.3890$, $p < 0.001$ in Model 3), making them the most influential variable in our analysis.

The magnitude of this effect (coefficient of -3.27) far exceeds that of other variables, confirming that prohibitive borrowing costs are the main obstacle to financing entrepreneurship in the DRC.

High debt has positive but insignificant effects ($\beta = -0.0118$, $p > 0.10$), suggesting that the burden of existing debt, unlike concerns about quality, does not significantly limit access to additional financing.

These results are consistent with those of Runde et al. (2021), who documented interest rates of 20% - 25% in sub-Saharan Africa. The dominant effect of interest rates validates the qualitative dimension of the AUQ framework, demonstrating that prohibitively expensive services effectively negate the benefits of access.

H4: A more developed digital ecosystem, including robust infrastructure, higher levels of human capital, expanded market access, and stronger institutional support, amplifies the positive impact of digital financial services (DFS) on entrepreneurship.

A stronger digital ecosystem enhances the impact of digital financial services, and several components of the ecosystem have significant positive effects:

Human capital: $\beta = 0.0879$, $p < 0.001$ Support: $\beta = 0.1106$, $p < 0.01$ Market access: $\beta = 0.0643$, $p < 0.001$ Mobile money (technological equipment): $\beta = 0.3746$, $p < 0.001$.

Infrastructure is not significant ($\beta = 0.4112$, $p > 0.10$), indicating a distinction between traditional physical infrastructure and digital ecosystem components.

This conclusion corroborates the work of [Gomes & Lopes \(2023\)](#), who emphasize that digital ecosystems function through complementary capabilities, support networks, and market connectivity rather than physical infrastructure alone.

The significant effect of human capital shows that education and skills help entrepreneurs navigate digital financial systems. Likewise, institutional support increases the effectiveness of digital financial services, supporting the interdependence of ecosystems described by [Stam & van de Ven \(2021\)](#).

H5: Better-quality formal institutions, including effective governance, transparency, and regulatory stability, positively moderate the relationship between the availability of DFS and entrepreneurial activity.

Governance has a negative coefficient (-0.0456), significant at the 5% level, Governance has a negative significant effect on access to finance, indicating that in environments where governance is perceived as poor, access to finance is more difficult, due to corruption or weak institutions.

H6: Favorable informal institutions, such as cultural norms supportive of entrepreneurship, trust-based social networks, and strong traditions of community financing, increase the likelihood that entrepreneurs will adopt and benefit from DFS.

The results are mixed:

Culture shows significance in model 3 ($\beta = 0.0806$, $p < 0.01$), but not in the SEM model, suggesting indirect effects.

Financial support (crowdfunding), which represents community financing networks, shows strong and consistent significance ($\beta = 0.1657$, $p < 0.001$ in SEM; $\beta = 0.1390$, $p < 0.001$ in model 3).

The robust effect of crowdfunding validates informal institutional channels. As [Mollick \(2014\)](#) notes, crowdfunding leverages social networks and trust in informal institutional assets, which are particularly relevant in contexts where formal institutions are weak.

The inconsistent significance of the culture variable may reflect measurement difficulties in capturing multifaceted cultural orientations toward entrepreneurship and risk-taking.

Model fit statistics, such as RMSEA (0.040), CFI (0.968), TLI (0.933), and SRMR (0.020), indicate that the model fits the data well, suggesting that the identified relationships are robust and reliable.

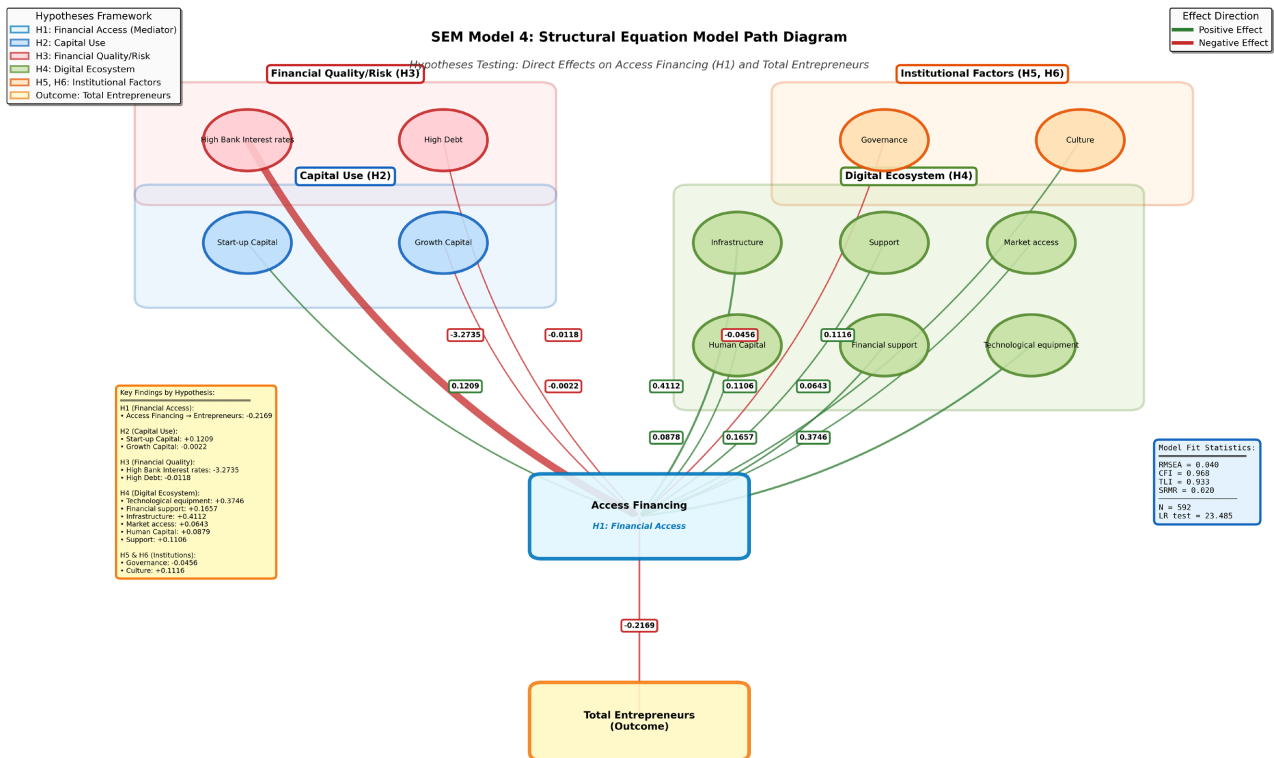


Figure 2. Structural equation model—Path diagram. Source: Authors.

The SEM findings reinforce the critical role that technological advances (such as mobile money) and innovative financial mechanisms (such as crowdfunding) play in overcoming traditional barriers to financing in the DRC.

However, bank interest rates and poor governance continue to pose significant challenges. Efforts to improve governance, expand market access, and strengthen human capital development are essential to create a more enabling environment for entrepreneurship. In addition, leveraging and promoting mobile money and crowdfunding could significantly improve financial inclusion and entrepreneurial activity in the DRC.

5. Conclusion

This study provides empirical evidence on how digital financial services (DFS) shape entrepreneurial development in the Democratic Republic of Congo (DRC) through the interconnected dynamics of financial inclusion, the digital entrepreneurial ecosystem, and institutional conditions.

By testing six hypotheses across four major cities Kinshasa, Lubumbashi, Goma, and Matadi within an integrated framework combining the AUQ (Access-Use-Quality) model of financial inclusion, the digital ecosystem framework, and institutional theory, the research offers several important insights.

First, the findings reveal that financial quality particularly the cost of borrowing plays a more decisive role in entrepreneurial outcomes than mere access to financial services.

Bank interest rates consistently emerge as the strongest barrier to SME financing and aligning with financial inclusion literature that emphasizes cost and suitability of services over availability alone.

Conversely, the expansion of digital financial mechanisms, particularly mobile money (as a proxy for technological readiness) and crowdfunding (as financial support), shows a significant positive effect on access to financing.

These results underscore the transformative role of DFS in reducing liquidity constraints and compensating for the shortcomings of traditional banking services, highlights the potential of digital financial innovation to close Africa’s SME financing gap estimated between USD 140 - 170 billion.

The analysis further demonstrates the centrality of the digital entrepreneurial ecosystem. Entrepreneurship thrives where digital infrastructure, human capital, and market connectivity are stronger, confirming the moderating role of the digital ecosystem. These results emphasize that physical infrastructure alone is insufficient; complementary capabilities such as digital literacy, market access, and technological equipment are equally critical.

A notable and unexpected finding concerns the role of institutions. Governance (proxy for the formal institutional environment) shows a significant negative relationship with access to finance in the mixed-effects model. This suggests that the inefficient institutional contexts, entrepreneurs may rely more heavily on informal mechanisms, such as community-based support networks and crowdfunding, which become compensatory tools. This nuance challenges linear institutional assumptions and contributes to institutional theory by illustrating how weak formal institutions may inadvertently strengthen informal entrepreneurial practices.

Spatial disparities reinforce these findings. Kinshasa and Lubumbashi outperform Matadi, owing to superior digital infrastructure, better market opportunities, and relatively lower financing constraints. These differences highlight the need for spatially targeted policies rather than uniform national strategies.

Methodologically, the use of structural equation modeling (SEM) adds value by uncovering mediating relationships that conventional regressions may overlook, contributing to a more holistic understanding of how financial, digital, and institutional dimensions interact to shape entrepreneurship.

Based on the findings of this research, several concrete recommendations can be formulated to improve the entrepreneurial environment in the DRC:

1) Reduction of borrowing costs: Monetary authorities and financial institutions should explore solutions to lower interest rates applicable to entrepreneurs, making financing more accessible. These could include:

- ❖ Expanding credit guarantee systems to reduce the perceived risk of lending to SMEs and enable banks to offer lower interest rates.
- ❖ Introducing subsidized or mixed financing mechanisms for priority sectors (agribusiness, manufacturing, services), particularly in underserved areas such as Matadi and Goma.
- ❖ Promoting competition in the banking sector, including the entry of digital

lenders and microfinance institutions into the market, to reduce price concentration.

- ❖ Encouraging risk-based lending approaches using alternative data (mobile money, digital transactions) to set fairer prices for loans and reduce collateral requirements.

2) Promotion of financial technologies: Policymakers should therefore prioritize the development and diffusion of these tools through the following actions:

- ❖ Strengthen the digital financial services (DFS) regulatory framework, particularly for crowdfunding and peer-to-peer financing, ensuring transparency, investor protection, and formal market recognition.
- ❖ Encourage interoperability between mobile money providers and banks, enabling smoother transfers, improved digital credit scoring, and integrated SME payment solutions.
- ❖ Support the development of digital credit products using mobile transaction histories, which can allow lenders to assess SME risk profiles more accurately.
- ❖ Promote inclusive digital literacy programs, particularly for women and young entrepreneurs, to increase the effective usage not just access of DFS tools.
- ❖ Facilitate partnerships between fintechs, microfinance institutions, and business incubators, creating hybrid financing solutions adapted to local market realities.

3) Strengthening governance: Reforms aimed at increasing transparency, administrative efficiency, and combating corruption could create a more conducive environment for entrepreneurship. A strong institutional framework is fundamental to encouraging entrepreneurial initiatives.

4) Entrepreneurial culture: Implementing educational programs and awareness campaigns is essential to strengthening entrepreneurial culture, particularly in regions where this culture is underdeveloped. Encouraging entrepreneurial values from an early age could transform perceptions and foster more initiatives.

5) Investment in technological infrastructure: To maximize the impact of innovations such as mobile money and crowdfunding, it is crucial to develop technological infrastructures and enhance human capital across the country. This will enable entrepreneurs in all regions to fully leverage new financing opportunities, thereby fostering more inclusive economic growth.

One important limitation is the difficulty in fully capturing the operational dynamics of crowdfunding due to limited data availability. Future research should incorporate richer datasets and explore emerging financial innovations such as peer-to-peer lending, digital scoring systems, and blockchain-based financing to better understand their potential contribution to the entrepreneurial ecosystem.

In summary, this research demonstrates that transforming the entrepreneurial landscape of the DRC requires a multi-dimensional approach that goes beyond expanding financial access. Improving financial quality, strengthening the digital ecosystem, reforming institutions, and reducing spatial inequalities are essential levers for creating a dynamic, inclusive, and sustainable entrepreneurial environment.

More broadly, these findings enrich the African entrepreneurship literature by illustrating how digital financial innovations when embedded in supportive ecosystems can catalyze economic growth and narrow persistent financing gaps across the continent.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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