The Role of Artificial Intelligence Technologies in Expediting Financial Inclusion: The Case of Selected African Countries

Vatimetou Mokhtar Maouloud[a*], Auwal Adam Sa'ad[b], Salina Kassim[c],
Anwar Hasan Abdullah Othman[d]

[a]University of Nouakchott-FSJE-URMCD, Mauritania
[b,c,d]IIUM Institute of Islamic Banking and Finance, International Islamic University Malaysia

[*]Corresponding author: fatismed95@yahoo.fr

Abstract

Artificial intelligence (AI) is a revolutionary technology that has been used tremendously in the contemporary industrial revolution 4.0 technology. AI has played a crucial role in accelerating the financial inclusion rate by easing the use of financial products. From the African perspective, there is a very few notable uses of AI technologies in the banking and finance industry, but such uses are not advanced in nature. Therefore, this paper attempts to study the role of AI for financial inclusion in some selected African countries. This paper is a conceptual study that uses a systematic literature review of 11 recent published papers about the relationship between AI and financial inclusion in the context of Africa. This study uses various and most recent published papers obtained from different online databases (mainly Scopus, Emerald, Elsevier, Tailor & Francis, Springer, EBSCO, and JSTOR) to investigate the conceptual and empirical role of AI on financial inclusion and poverty in some selected African countries. The study reveals that mobile money and crowdfunding are the most common fintech tools used in Africa. Therefore, some recommendations are provided for governments and policymakers to instigate techniques that will enhance digital financial inclusion, including using Artificial Intelligence for poverty alleviation in Africa.

Keywords: *Africa, Artificial Intelligence, Digital financial inclusion, Fintech, Poverty alleviation*

1. Introduction

Most developing countries population are excluded from the formal financial system (Kshetri, 2021). There are around 1.7 billion people worldwide who have neither a formal financial account nor a mobile banking account based on the World bank's Global Findex database. For instance, in Mauritania, only 21 per cent of citizens have a financial inclusion (Bouasria et al., 2020; Maouloud et al., 2021a). This financial exclusion is among individuals and small and medium enterprises where 200 million of them lack finance (IFC, 2017). Financial inclusion is the ease of access and usage of financial products and services. Indeed, financial inclusion is an essential tool to alleviate poverty among vulnerable people and societies (Lal, 2018). As a result, it can enhance individuals' wellbeing by increasing children's education, women empowerment, and financial independence (Saviano et al., 2017). Being financially included is indispensable for humans, like having access to electricity (Peachy and Roe, 2006).

Artificial intelligence is the use of new technologies in different life domains. AI has been in use for various banking business, economic development, political and medical environments. In finance, the use of AI has enhanced the utilisation of financial services in several countries (Kshetri, 2021). FinTech is a portmanteau for financial technology that numerous banks and companies enormously use to reduce the physical distancing for people to allow easy access to financial services. Fintech is advantageous for uplifting the economy and financial stability for groups and individuals and upgrading their social life economically (Kusimba, 2018; Lee,

2020).

Even though the use of AI has been widely discussed in developed countries, the African countries are still left behind and lack actual representation in research and application of Artificial intelligence in their societies. Looking into the several difficulties facing African countries, particularly poverty, the embracement of AI is limited (Achugamonu et al., 2020). Thus, this study explores the extent to which AI is used to enhance the financial inclusion rate among African countries where a scarcity of study exists. This study will be among the pioneers and most recent studies which discusses the role of AI in financial inclusion in Africa.

This research contains five sections, and it is organised as follows: the first section presents the introduction, which includes the background of the topic, research gap, and the objective of the study. The second section includes the literature review, which contains the theory underpinning the study, empirical and conceptual studies found in Africa. The third section discusses the methodology. The fourth section proposes recommendations to uplift digital finance among Africans. Finally, the fifth section presents the conclusion of the study and brings areas for future studies.

2. Literature Review

The primary purpose of using fintech is to reduce the risk of market anomalies, such as asymmetric information. This study is underpinned by the transaction cost innovative theory (Niehans, 1983). This theory is used because it matches the evolution and development of AI and fintech in the era of industry 4.0. Indeed, the advancement of AI results in reduced transaction costs, enabling better communication and information between lenders and borrowers. Hence, fintech is a potent mechanism in promoting financial inclusion and getting rid of the fragile financial system.

Fintech is a buzzword that indicates the use of different technologies to ease the use of financial services, commonly known as alternative finance (Baeck et al., 2014). The alternative finance enables safe and fast transactions through different digital models, such as crowdfunding, peer-to-peer (P2P) business lending, and P2P consumer lending. All of which has mostly increased financial inclusion rates in the world entirely, mainly in African countries. Because of the numerous advantages of fintech in easing the transactions such as saving, remittances, money withdrawals, there are more than US$50 billion have been invested in it through out more than 2500 companies worldwide (Sy et al., 2019). Financial technology can reduce income inequality in Africa by augmenting financial inclusion rate (Chinoda and Mashamba, 2021).

The most promising fintech models in Africa are mobile money and crowdfunding (Makina, 2019). According to the Global Findex Database 2020, more Africans have mobile money accounts than those who have an account in the financial institution (Demirgüç-Kunt et al., 2020). Mobile money account is considered formal financial accounts, which is developed by mobile technologies. Crowdfunding is mainly about raising funds for starting-ups, small and medium enterprises, and microenterprises through online platforms. Other fintech schemes are useful in the African case, mainly the payment apps, mobile wallets, cryptography, and Robo-advisors which is still more advanced for Africa usage. The robo-advisor helps the investors to build portfolio through some equations and algorithm methods.

Table1: African crowdfunding platforms, internet, and Facebook penetration

Country	Number of crowdfunding platforms (2015)	Internet penetration 30 June 2017 (% population)	Facebook penetration (%population) 30 June 2017
Algeria	2	45.2	43.8
Egypt	5	39.2	34.7
Ghana	2	34.7	14.0
Kenya	2	89.4	12.8
Ivory Coast	2	26.5	10.1
Morocco	4	58.3	34.1
Nigeria	9	47.7	8.3
Senegal	2	25.7	14.3
South Africa	21	54.0	28.9
Togo	2	13.0	4.4
Tunisia	2	50.9	50.5
Uganda	2	45.6	5.3
Zimbabwe	2	41.1	5.2

Source: (Boum, 2019)

Crowdfunding is still underdeveloped in the case of Africa and most of countries did not use it yet. It is clear from Table 1 that the most developed country is South Africa which has more than 20 crowdfunding platforms. Indeed, crowdfunding has numerous gains for the countries' economy, especially African countries due to its ability to gather funds for the enterprises to grow up, sustain, and be more competitive. A study conducted in Africa revealed that attitude and perceived behaviour control have a positive impact on the intention to use cryptocurrency (Mazambani and Mutambara, 2019).

Mobile money is widely used in African countries. In Somalia, Ghana, and Kenya, mobile money usage is remarkable among young and middle-aged generations (Ahmed and Ali, 2017; Tobbin and Kuwornu, 2011). Few African countries have embraced mobile money, such as Mauritius, Tanzania, Uganda, and South Africa. The case of Kenya is the most developed among African countries because of the use of M-PESA (Achugamonu et al., 2020). Nevertheless, Nigeria is promoting financial inclusion through bank-led use, which cannot ease access to ultra-poor that cannot afford banks services costs. The mobile phone markets are getting advanced, especially in the Sub-Saharan African countries (SSA) regions, due to the high level of youth in those countries (Winiecki and Kumar, 2014).

In Africa, having a mobile account is more than having a formal account at a financial institution due to the use of national identification systems which enhanced money transfers between individuals. More specifically, the SSA region has become the global leader for mobile market in the world because of the most developed mobile companies such as Telcom in east Africa, Safaricom in Kenya, Vodacom in Tanzania (Sy et al., 2019). Table 2 presents the number of the SSA citizens holding a phone, sim connections, and smartphones. Indeed, the mobile market has contributed to the economy by elevating the Gross Domestic Production (GDP) of the region by 7.7 per cent which can be increased to reach 8.6 per cent.

Table 2: Sub- Saharan Africa (SSA) Mobile industry statistics

	2016	2020 (estimate)
Unique mobile subscribers	420 million	535 million
Sim connections	731 million	942 million
Smartphones	198 million	498 million
Mobile internet penetration	26%	38%
Mobile industry contribution to GDP	7.7%	8.6%

Source: (Makina, 2019)

Approximately 30 percent of the SSA members have mobile internet. This fact impedes the usage of online financial products, and it can be the principal reason behind the low financial inclusion rate in the region. However, there is an optimistic future of the AI in the region where the number of internet user might reach around 40 per cent of the population by 2020.

The use of AI increases customers' satisfaction by reducing the physical movement costs, call bills, and time flexibility to get the services wanted (Mhlanga, 2020b). Much of the interest in AI is related to its ability in enhancing financial inclusion which is spurring enormously by the innovations in diversification products, easing the usage, lowering access costs, reducing documents required, improving products quality, and enhancing financial institutions' efficiency and sustainability (Pollio and Cirolia, 2022). In fact, the use of the internet in transactions reduces the physical access to institutions and saves money and time.

In Nigeria's case, the United Bank for Africa (UBA) has helped its customers performing several online financial transactions through the banking chatbot called Leo. The customers need to have internet and chat directly with Leo through any social media tool, and the response will be provided immediately. The fully digital bank in south Africa (TymeBank) has also reduced the services costs for its customers through online communications. This bank does not employ people in branches, and its apps (e.g. financial education app, TymeCoach) provide financial decisions for customers (Malinga, 2019).

Table 3: Well-known African fintech companies

Country	Company Name	Use of AI
Nigeria	United Bank for Africa (UBA)	A banking chatbot (Leo) enables customers to transfer funds, pay bills, check financial account and other financial services
Nigeria	InterSwitch	Africa-focused integrated digital payment commerce solutions
Nigeria	Paga	Delivers universal access to financial services across Africa
South Africa	TymeBank	It interacts with customers online and in person.
South Africa	RainFin	Online lending marketplace that connects borrowers with lenders
South Africa	22Seven	Budgeting & investing app
South Africa	Bankymoon	Builds blockchain-based solutions
South Africa	ExpenZA	Assist budgeting by automatically keeping track of transactions
South Africa	GetBucks	Online lender that manages credit profiles and budgets
South Africa	Gust Pay	An app that facilitates smart mobile payments
South Africa	IMB	Online payment platform
South Africa	Nomanini	Enable transactions in the cash-based informal retail sector
South Africa	Zoona	Provide money transfer and other services to unbanked consumers
Kenya	Bitsoko	Mobile money payment platform that uses blockchain technology
Kenya	Cellulant	Provide mobile payments across 11 African countries
Kenya	Safaricom Chatbot assistant Zuri	M-PESA Helps customers to do online top-up, cancelling SMS services, checking m-pesa, and managing subscription
Kenya	InVenture	Provides a credit scoring and real-time credit
Kenya	Musoni	Microfinance leveraging ICT and mobile technology

Source: (Friendsvow, 2017)

From Table 3, there are few African countries having fintech companies. Kenya and South Africa are leading the AI advancement in Africa. Those countries have the most developed and popular fintech companies that have improved their financial system and helped individuals to be inclusive and gain shared prosperity. Nigeria also has some well-known fintech companies that have increased financial inclusion among unbanked. For other African countries, there is an optimistic future for the advancement of fintech since it is getting popular and its outcome are obvious in reality (Sy et al., 2019).

African countries have benefited from fintech by blurring the boundaries among markets, financial institutions, and non-financial services providers, enhancing product quality and diversification, leading to an increase in the financial inclusion rate (Makina, 2019). The use of Fintech facilitates access to rural African households, especially through mobile money and e-wallets tools, which can increase their financial independence and enhance their prosperity (Indrasen, 2017; Mhlanga, 2020b). In the MENA region, the crucial role of fintech on financial inclusion has been confirmed by several studies (Al-Smadi, 2022).

Fintech can spur the economy of developing countries by raising the GDP rate, especially the Sub-Saharan African countries (SSA) region (Sy et al., 2019). According to the Mckinsey Global Institute report, the developing countries can enhance their GDP up to six per cent by 2025, especially countries with very low financial inclusion rate, such as Ethiopia and Nigeria (Manyika et al., 2015). Those countries would have the potential to increase their GDP by 10 to 12 per cent. Furthermore, fintech enables individuals to be financially independent and enhance their prosperity and wellbeing (Panos and Wilson, 2020).

Digitalisation greatly contributes to the economic development and social wellbeing of individuals and societies (Kwilinski et al., 2020). However, some studies find that the impact of AI on socio-economy wellbeing is questionable, not yet confirmed by empirical studies (Ozili, 2020a). Although Fintech has a predominantly positive impact on socio-economic development and individual wellbeing, it has some drawback since it can replace the human jobs with robo-jobs and create new types of risk that was not expected previously.

3. Research Methodology

This paper uses a content analysis methodology through a systematic literature review to determine the impact of AI on financial inclusion in African countries. The keywords are related to the title and objective of the study. The research has been focused on keywords such as "artificial intelligence", "digital finance", "fintech", "financial inclusion", and "African countries". The review was performed in various well-known and high indexed databases: Scopus, Elsevier science direct, Tailor & Francis, EBSCO, and JSTOR using (Kitchenham, 2004) guideline. All potentially relevant papers, based on the title, were kept aside in a specific folder. Few papers were found in the African countries, around 30 papers. Following the articles' selecting based on the abstract and full-text screening, only 11 were maintained in this study.

Table 4: Keywords combination and number of articles

Keywords searched	Number of articles	Number of articles considered
"artificial intelligence" AND "digital finance" AND "Africa"	15	9
"fintech" AND "financial inclusion" AND "African countries"	30	13
"digitalization" AND "financial inclusion" AND "Africa"	15	8
TOTAL	60	30
FINAL FILTERING		11

Most articles published on the topic in the African context are in the five previous years. Since innovative research and development methods are not very common in Africa, the importance of fintech and digital finance is recently incorporated in the African interests. The most recent analysed studies reveal that the potential of using AI in Africa is increasing at a moderate pace, and financial inclusion is getting higher in recent years. Following the process of the identification of the keyword used by several authors in the systematic literature review (Hanif and Haron, 2022; Mpofu and Mhlanga, 2022). The articles were found with their keywords using the method of Boolean search AND between quotation marks. Figure 1 shows in brief the process of section of the articles.

Figure1: Screening process of article selection
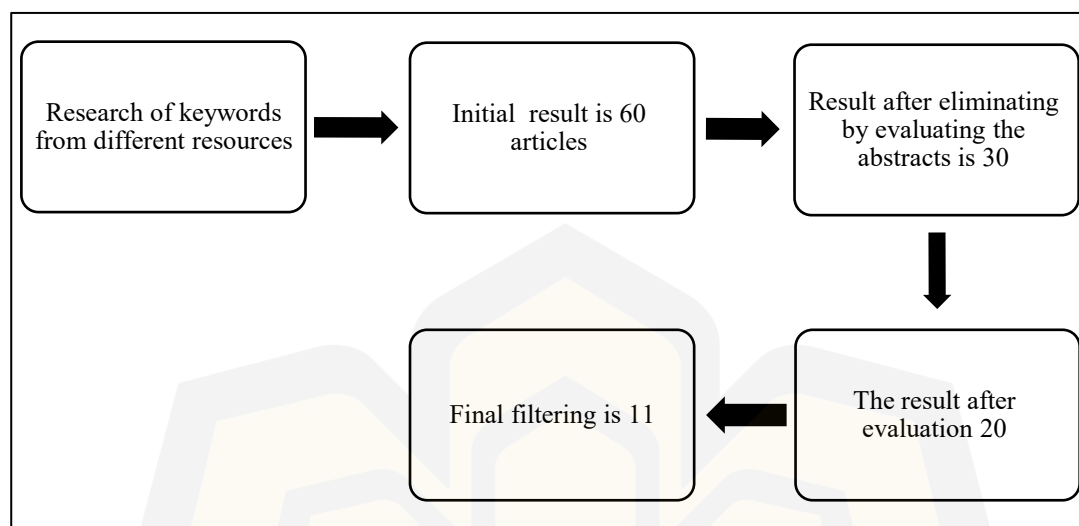
4. Proposed Recommendations

Fintech is an effective strategy to enhance the development of countries, particularly African countries. It also increases the African countries economy in reducing the international transfers charges (Makina, 2019). Most Africans mainly live on remittances from their relatives abroad, which improves their living standards and wellbeing. Hence, governments should seriously consider the use of AI in money transfers and policies that can enhance it (Igwilo and Sibindi, 2021). For instance, the use of blockchain technology can ease international money remittances. Blockchain technology is a robust innovation that ensures a safe and secure transaction between both parties (Sy et al., 2019).

The enhancement of digital finance is indispensable to increase financial inclusion and alleviate poverty in Africa. Besides that, African countries lack proper financial infrastructure, such as energy. Only 40 per cent of Africans have a proper infrastructure with a reliable electricity supplier, and 68 per cent from SSA countries live without electricity (Oyuke et al., 2016). Also, African countries have the lowest internet connectivity in the world. Since digital financial increases economic growth, governments are advised to promote digital financial inclusion by adopting strategies that enable countries to follow detailed action plans (Arakpogun et al., 2021). The first step should be focused on providing adequate financial infrastructure that enables people to use electricity. Also, offering strong internet connectivity is a crucial policy to develop the use of fintech (Mhlanga, 2021; Ozili, 2020a).

The usage of digital financial services in Africa has enormously increased digital financial inclusion because most of unbanked people have benefited from using mobile money services and cell phones banking (Mpofu and Mhlanga, 2022).

To enhance financial inclusion, governments should ease the opening of account by lowering their costs and financial services charges in general. The affordability of costs is among the main barriers to use financial products (Bouasria et al., 2020). Also, adopting lenient rules in providing services to less fortunate people is necessary to enhance the financial inclusion rate among unbanked populations (Maouloud et al., 2021b). For instance, the reduction of documentation required and the use of e-KYC (Know Your Customer) will enhance the eligibility of households and entrepreneurs to use more products and services (Maouloud et al., 2019; Panos and Wilson, 2020). A careful consideration in financial inclusion barriers is needed to boost the financial development and increase the number of banked people.

Financial institutions should spread awareness about the use of financial products, especially digital services. Indeed, less educated people find difficulties in using digital products. Providing training on the effective usage of digital products can reduce poverty and increase financial inclusion among the vulnerable (Hinson et al., 2019; Kwilinski et al., 2020). The level of digitalisation positively affects the development of the economic situation and reduce income inequality (Chinoda and Mashamba, 2021; Demir et al., 2022). It

can also enhance the financial capability and financial trust between customers and financial services providers (Brown et al., 2019). Therefore, African governments should encourage financial institutions to incorporate digital finance more in their transactions, such as expanding the number of ATMs and reducing cash payments (Achugamonu et al., 2020; Langley and Leyshon, 2022; Ozili, 2020b). Fintech can help microfinance institutions in reducing poverty, income inequality and also mitigating risk- taking (Banna et al., 2022; Mhlanga, 2020a).

Microenterprises are pillars of economic growth; thus, providing financing develop them more and prevent them from bankruptcy which can adversely affect the country's economy. Microentrepreneurs should be taught the use of digital finance to expand enormously their business (Ashenafi and Dong, 2022; Ketterer, 2017). Due to the high poverty rate in African countries, several dwellers are not educated and live in rural areas where a lack of financial services exists. The government should encourage banks and financial providers that expand their outreach to rural entrepreneurs by lowering the taxes and provisions charges (Senyo et al., 2022).

Table 5: Summary of the previous articles

Article	Title	Author name and year of publication	Journal name	Objective of the research
1	Digital Financial Inclusion, Digital Financial Services Tax and Financial Inclusion in the Fourth Industrial Revolution Era in Africa	Mpofu and Mhlanga (2022)	Economies	The article attempts to analyse the link between digital financial service growth and digital financial inclusion in African countries. Also, it explores the imposition and potential of digital financial services taxes in Africa.
2	Fintech, financial inclusion and income inequality nexus in Africa	Chinoda and Mashamba (2021)	Cogent Economics & Finance,	This study analyses the relationship between financial inclusion, financial technology, and income inequality in 25 African countries.
3	FinTech ecosystem practices shaping financial inclusion: the case of mobile money in Ghana	Senyo et al. (2021)	European journal of information systems	The paper elaborates a theory that can explain the role of fintech in the financial inclusion in Ghana.
4	Fintech-based Financial Inclusion and Risk-taking of Microfinance Institutions (MFIs): Evidence from Sub-Saharan Africa	Banna et al. (2022)	Finance Research Letters	This research investigates the impact of fintech-based financial inclusion on the risk-taking in microfinance institutions in the SSA region.
5	Examining the Relationship between Digital Finance and Financial Inclusion: Evidence from MENA Countries	Al-Smadi (2022)	Borsa Istanbul Review	This study examines the relationship between digital finance and financial inclusion in the Middle East and North Africa (MENA) region
6	Artificial Intelligence in Africa: Challenges and Opportunities	Arakpogun et al. (2021)	Springer Nature	The article discusses the problem-driven approach to drive recommendation for African governments robust artificial intelligence policies to be used.

7	ICT Adoption and Stock Market Development in Africa: An Application of the Panel ARDL Bounds Testing Procedure	Igwilo and Sibindi (2021)	Journal of Risk and Financial Management	This study examines the causal relationship between ICT adoption and stock market development in Africa.
8	Neo-colonial credit: FinTech platforms in Africa	Langley and Leyshon (2022)	Journal of Cultural Economy	This paper discusses the fintech in Africa.
9	Fintech urbanism in the startup capital of Africa	Pollio and Cirolia (2022)	Journal of Cultural Economy	This paper argues for a more descriptive, ambivalent, and urban reading of the implications and stakes of fintech in South Africa.
10	Predicting FinTech innovation adoption in South Africa: the case of cryptocurrency	Mazambani and Mutambara (2019)	African Journal of Economic and Management Studies	the purpose of this paper is to apply the theory of planned behaviour (TPB) to predict behavioural intention to adopt cryptocurrency
11	Determinants of FinTech payment services diffusion by SMEs in Sub-Saharan Africa: evidence from Ghana	Coffie et al. (2020)	Information Technology for Development	The study assesses the determinants of the diffusion of FinTech Payment Services (mobile money, card, and online payments) by SMEs in the context of Ghana

Source: Authors' compilation from various sources

5. Conclusions

The study has discussed the role of AI on financial inclusion in the African context. Through a systematic literature review, it has been found that fintech is a revolutionary technology that boosts financial inclusion in Africa, especially through mobile money and crowdfunding models. Although AI is not well spread in Africa, and most countries are still not using it, it has a predominantly positive effect on countries' economic development that makes use of it so far. Also, it has been found in the research that the main barriers which hamper African countries from developing fintech models are the weak financial infrastructure, poverty, and low internet connectivity. Hence, it is recommended for the African governments and decisionmakers to adopt initiatives that can enhance the use of technology to alleviate poverty and achieve inclusive economic growth.

This study is a conceptual paper where no empirical data was collected and there are no statistical tools used. The methodology used in this paper in the systematic literature review to analyse the latest update on the topic in Africa. Therefore, future studies can use primary data collected from selected African countries to get more findings and interpretations to explore AI's impactful role in financial inclusion.

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