

## The role of artificial intelligence in promoting financial inclusion in developing countries

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### **Abstract:**

According to the World Bank's Global Findex database, about 1.7 billion adults were unbanked in 2017, which means that they lacked an account with a formal financial institution or a mobile money provider. Most of the unbanked population is in developing countries. In South Sudan, for instance, only 9% of the adults had a bank account. Similarly, about 70% of the population in Latin America is unbanked or underbanked (Rojas-Torres, Kshetri, Hanafi, & Kouki, 2021). Likewise, according to the International Finance Corporation, over 200 million small and medium enterprises (SMEs) in developing countries lack access to financial services.

**Keywords:** editorial | financial technology | artificial intelligence

### **Article:**

#### **Introduction**

According to the World Bank's Global Findex database, about 1.7 billion adults were unbanked in 2017, which means that they lacked an account with a formal financial institution or a mobile money provider. Most of the unbanked population is in developing countries. In South Sudan, for instance, only 9% of the adults had a bank account. Similarly, about 70% of the population in Latin America is unbanked or underbanked (Rojas-Torres, Kshetri, Hanafi, & Kouki, 2021). Likewise, according to the International Finance Corporation, over 200 million small and medium enterprises (SMEs) in developing countries lack access to financial services.

Addressing the above issues by promoting financial inclusion is key in improving the living standard, overall quality of lives, and well-being of disadvantaged groups in the developing world. In nutshell, financial inclusion involves ensuring individuals' and enterprises' access to useful financial products and services to meet their needs at affordable rates (worldbank.org, 2018). Having financial access is an important prerequisite for day-to-day living as well as for planning long-term goals and emergencies (worldbank.org, 2018).

Artificial intelligence (AI) and machine learning (ML) are rapidly developing and are bringing political, economic, and social transformation in developing economies. AI-based solutions are thus likely to emerge as a game-changer that have important implications for expanding financial access to poor people. This is because traditional banks are unwilling and reluctant to serve the small-scale borrowers such as low-income people and small businesses due to high transaction costs and inefficient processes associated with making small loans to these borrowers (Kshetri, 2019).

AI is transforming the consumer financial services market as well as consumers' interaction with the financial services ecosystem. This shift has been driven by maturing AI algorithms, growing AI investment, increasing competition, and rapid changes in consumers' preferences for digital financial products facilitated by AI.

As more and more Financial Technology (FinTech) companies and banks are minimizing physical branches, AI-based digital personal lending has expanded in the Global South. Credit scores that are calculated by ML algorithms are expected to improve financial institutions' abilities to score credit-poor consumers, which is likely to expand financial inclusion.

Unsurprisingly, a large number of FinTech companies have started experimentation with AI. In many developing economies, banks and financial institutions have made progress in the use of AI in operational processes. Chatbots are being used for the front office operations. In the so-called middle-office functions, AI is being deployed in know your customer (KYC)/anti-money laundering (AML). AI is used to manage risk underwriting for the back office (Decosmo, 2019). The use of AI in higher-level functions such as biometrics and voice assistants has been rare (Decosmo, 2019). Of special interest to us is its role in promoting financial inclusion. In Table 1 we list and describe some well-known developing world-based financial companies that have utilized AI.

**Table 1.** Some well-known developing world-based FinTech firms that have utilized AI

Company	Country	Use of AI	Outcome
Ant Group's AI-based customer service chatbot	China	Handles 2 to 3 million queries per day. It uses deep-learning technology to detect fraud (Kshetri, 2020).	Losses related to fraud: one in 1 million. Outperformed human agents in customer satisfaction.
UBA	Nigeria	A banking chatbot Leo helps customers to transfer money, pay bills, buy airtime, check account balance and other functions.	Available 24 hours a day and faster than human agents
Safaricom Chatbot assistant Zuri	Kenya	Provides services such as managing subscription, canceling SMS services, reversal of money sent to a wrong recipient, airtime top up and checking M-PESA and airtime balances.	To reverse pay, a M-PESA user no longer needs to contact a customer service team, which takes a long time.
TymeBank	South Africa	Interacts with customers online and via kiosks. The bank has only 250 employees, compared to about 50,000 in an average South African bank.	Serve consumers at a low-cost (e.g., card replacement charge is R40, much lower than competitors).

The implementation of AI in a financial company can bring a number of benefits. First, AI-based systems provide a faster response which results in higher customer satisfaction. For instance, Nigeria's United Bank for Africa's (UBA) has a banking chatbot called Leo that helps customers with a number of transactions such as transferring money, pay bills, buy airtime, and check account balance (mTransfersHQ, 2018). Customers can chat with Leo on WhatsApp, Facebook messenger, and apple business chat. The chatbot responds immediately.

Likewise, Mexico's Konfio, which provides online financial services for SMEs, makes loan disbursement in about 24 hours to small and midsize companies compared to months taken by traditional banks. According to a Bloomberg article published on September 6, 2019, its interest rates are half of those charged by traditional banks and delinquency rate was 4.8% in 2018, compared with 5.4% for the banking industry in general. Konfio utilizes alternative data sources, artificial intelligence, and data science in its lending decisions. A December 3, 2019, article published by the e-commerce and online payment news outlet PYMNTS.com reported that Konfio borrowers can complete the application process in about eight minutes. Its loans average US\$12,000, compared to US\$40,000 for traditional banks in Mexico. Companies such as Konfio use systems with enormous processing power, which allow them to handle large amount of data in a short time. AI algorithms can also analyze risk cases and flag them.

Second, AI-based systems can reduce fraudulent transactions. Fraud detection systems can analyze customers' behavior and other information to trigger a cybersecurity mechanism when anomalous activities occur. Banks also employ AI to prevent money laundering. ML can recognize many suspicious activities that human beings are not capable of. The costs of investigation in transactions involving money-laundering can thus be cut drastically using ML. For instance, Ant Group, the financial affiliate of China's Alibaba Group Holding, uses deep-learning technology to detect fraud (Perez & Soo, 2017). The company's losses related to fraud are one in 1 million (Perez & Soo, 2017). AI-based systems can thus address problems related to high costs of due diligence, which has been a serious concern in many developing economies. For instance, due primarily to frauds, bad loans account for about 20% of bank loans in India (Suberg, 2017). Loan frauds in the country are estimated at US\$2 billion annually, leading to low trust and thus high-interest rates (Pitti, 2018).

Third, AI can drastically reduce the operating costs for financial institutions since machines perform most of the work that human agents otherwise need to perform. For instance, Ant Group's AI-based customer service chatbot handles 2 to 3 million queries per day. Overall by using complex and sophisticated rules compared to those in traditional credit scoring systems, AI can provide a more accurate assessment of a borrower faster than human agents and at a lower cost.

Similarly, South Africa's TymeBank which describes itself as a "fully digital bank" utilizes AI to interact with its customers online and via kiosks. There are no human beings providing services at call centers and branches. The bank has been able to serve consumers at a low-cost. For instance, according to a November 14, 2019, article published in South Africa's business news website BusinessTech, TymeBank's card replacement charge is R40 (rands) compared to FNB's R110 and Standard Bank's R55.

In order to verify the customer's identity at a kiosk, TymeBank's system is linked with the database of the Department of Home Affairs to capture biometric data. The service was started in November 2018. It had 670,000 customers by August 2019 (Malinga, 2019). It has 250 employees, compared to about 50,000 employees in an average South African bank. TymeBank's financial education app, TymeCoach helps users make better financial decisions. The app's AI-based chatbot answers financial management-related questions. It also provides customers with their credit report information (Malinga, 2019).

As another example from a related setting, Alibaba has been using AI-powered chatbots on the company's e-commerce site Taobao. In 2017, its customer-service chatbot Alime Shop Assistant handled more than 93% of customer queries. The company estimated that in order to handle the queries, 83,000 human customer service agents would have been needed.<sup>1</sup>

In summary, AI-based systems are being used in financial institutions in developing countries in a number of activities. Below we describe some key features of such systems.

### **Investment Strategy Recommendations**

Some developing world-based FinTech companies provide investment strategy recommendations using AI. One such example is Indonesia's Halofina, which describes itself as a goal-based robo-advisor platform. A Fintechnews Indonesia article published on March 26, 2020, explained that Halofina, allows customers to manage personal finance based on their goals. Its users can invest directly from the mobile app.

Some AI-based digital advice platforms target consumers with certain religious beliefs. For instance, Malaysia's FinTech company ALGEBRA's Robo-Adviser offers financial advice with sharia compliant as well as non-sharia compliant investment options (<https://www.algebra2u.com/app/home/hello>). ALGEBRA generates a series of goals for its clients and indicates the investments needed to reach those goals. Then, the ML algorithm processes millions of data points from various sources to recommend stocks and create a risk-weighted portfolio. The platform manages the portfolio over time to achieve the desired goals.

### **Regulatory Compliance**

AI-based tools can help comply with regulatory and other requirements. In 2015, Malaysia's BIMB Investment Management Bhd partnered with the U.K.-based Arabesque Asset Management Holding Ltd to launch an AI-based multi-currency global equity fund. The fund complies with shariah laws as well as fulfills environmental, social, and governance requirements. It uses AI in the entire investment process.<sup>2</sup>

To take another example, Chilean FinTech company Ceptinel provides financial institutions AI and ML tools to ensure compliance with various regulations and assess risks related to money laundering, market abuse, and other fraudulent practices. The startup analyzes large amounts of

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<sup>1</sup> See <https://www.cmswire.com/customer-experience/where-ai-customer-experience-investments-are-paying-off/>

<sup>2</sup> See <https://www.theedgemarkets.com/article/fintech-funds-powered-ai>

data from multiple sources for this purpose. Its system provides real-time alerts to help prevent events and transactions that are potentially associated with illegal acts.

## **Fraud Reduction**

AI can be used to reduce engagement in fraudulent activities of a wide range of players in the banking and financial industry and market. For instance, merchants may engage in fraudulent activities. They may not fulfill their promise of delivering the goods after receiving payment. AI can analyze the authenticity of know your customer (KYC) documents with computer vision and pattern matching algorithms. AI can also look at the merchant's online behaviors from social media and other sources. In this way, AI can identify activities that are associated with potentially fraudulent behaviors.

Some FinTech companies have developed solutions for specific developing markets. For instance, PagShield is an AI-based antifraud tool, specifically designed for the Brazilian market. As explained in its website (<https://www.pagbrasil.com/services/fraud-prevention/>), it checks the address provided by potential borrowers with the IP geo-location. The system also analyzes customers' browsing patterns on websites. To do so, it considers factors such as device fingerprint, IP geo-location, proxy detection, and velocity checks. It also uses social graph, which involves looking at a consumer's relationships and interactions with others. An additional feature is proxy detection, which involves measuring the round-trip time between PagShield and a customer browser. The idea is to determine whether a proxy or VPN is being used by a fraudster.<sup>3</sup> The algorithm automatically makes adaptation to each e-commerce business, which allows it to identify anomalous behavior on the website.

## **Collections**

AI and ML are also effective in collections. They provide insights into the effectiveness of various approaches depending on given customer profile. Machine learning algorithms help determine which customers to wait on when they do not pay on time.<sup>4</sup> As an example, Chilean FinTech startup Colektia utilizes AI to improve businesses' collections processes. It looks at the operations and then recommends strategies that can be used to improve the collection process. It also offers a chatbot to increase efficiency. Contxto, which focuses on Latin America's technology, startups, and venture capital news and data, reported that Colektia had 15 customers in Latin American countries such as Chile, Colombia, Paraguay, and Mexico as of March 2020. Colektia's system reportedly reduces human intervention by up to 90% (Salazar, 2019).

## **Risk Assessment**

AI and ML can be used to manage lending risks in the market segment that has little or no information about credit history. These technologies are finding wider applications in developing economies. Indonesia's P2P lender, Crowdo uses AI to assess risk. Lenders are provided with detailed information about borrowers' businesses. The system also looks at businesses' risk

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<sup>3</sup> See <https://www.zdnet.com/article/stripe-rolls-out-new-fraud-prevention-tools-for-the-enterprise/>

<sup>4</sup> See <https://www.forbes.com/sites/louiscolombus/2020/12/29/10-ways-ai-is-going-to-improve-fintech-in-2020/#4a240a444ffd>

exposure to catastrophic events, such as pandemics. For instance, during the COVID-19, hotels and restaurants were classified as high-risk. As of March 2020, Crowdo had funded 5,000 projects in Indonesia. According to a Jakarta Post article published on April 1, 2020, its non-performing loan (NPL) ratio was reported at 1.89%, which was below Indonesia's gross NPL ratio of 2.5% in 2019.

Likewise, the Brazilian FinTech Rebel, which offers unsecured credit, combines AI, big data, and ML to analyze risks. According to an article published on August 13, 2019, by the Washington D.C.-based online technology media focusing on technology startups TechStartups.com, it offers credit of up to 50,000 reais (Brazilian currency) for up to 24 months. The interest rate is as low as 2.9% per month. Rebel offers consumers free access to its Rebel Score, which explains the credit profile and explains steps that can be taken to improve financial health.

To take another example, Guadalajara, Mexico-based Kueski, which provides loan services to Mexicans without any collateral or a personal meeting uses machine learning to conduct risk assessments of potential borrowers that lack credit history. It offers a personalized loan. Kueski also uses AI for fraud reduction. It does so by identifying unusual patterns from potential borrowers that are applying for a loan. Contxto reported that Kueski uses information submitted by the user as well as data collected from other sources.

As a final example, Nigeria's Migo uses machine learning to make lending decisions for middle and low-income consumers. Migo's partner banks also use its technology to reduce risks.<sup>5</sup> Potential borrowers provide personal information when they apply for loan. Based on the information, the loan amount varies from N500 to N500,000 (Nigerian currency: about US\$1.30 to US\$1300). The company's website explains that it normally starts with a small loan. Borrowers are eligible for larger amount when they build trust. For instance, borrowers who pay loans on time are viewed as more trustworthy. Migo's API is plugged in by its partner such as banks, telecommunications operators and merchants. According to an October 14, 2019, article by TechCabal, which focuses on African innovation, Migo had offered over 3 million loans to more than 1 million customers in Nigeria.

### **Improving Financial and Operational Performance of Borrowers**

AI is also being used to improve financial and operational performance of borrowers and help them succeed. Mexican FinTech Konfio has recognized the need to offer more than just lending to SMEs. According to a September 9, 2019, article published in the digital publishing platform FinTech Futures, Konfio also provides its one-million clients with technologies that offer insights into their customers and help them organize data.

As another example, consider the Brazilian FinTech Olivia. Its app is free to download. After the user gives consent, it connects to their bank accounts and monitors transactions and spending behavior. As reported by Contxto, its algorithm uses this information to provide personalized recommendation to improve spending behavior. An article published on January 15, 2020, by the Latin American Venture Capital Association reported that customers Itaú, Banco do Brasil,

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<sup>5</sup> See <https://techcabal.com/2020/02/24/artificial-intelligence-how-are-the-smartest-african-companies-using-it/>

Caixa Econômica Federal, Nubank, and other banks were connected to the platform. In the U.S., Olivia's AI-based system was trained with data from 18,000 financial institutions using information related to profiles, consumption habits, and financial transactions.

## **Concluding Remarks**

FinTech companies based in the developing world are utilizing digital technologies such as AI to assess, evaluate, and refine the creditworthiness of potential borrowers in new and innovative ways. The examples above illustrate how AI can drastically reduce operating and other costs, which can increase the efficiency of process and lead to lower transaction costs to provide small loans.

AI-based tools have helped developing world-based financial institutions and consumers to comply with various regulatory requirements and religious prescriptions. It is too time-consuming and even impossible for human agents to comprehensively identify and analyze all the relevant data to ensure that each transaction has complied with various obligations.

Several challenges and limitations must be overcome before AI can become a practical tool for developing world-based financial institutions. While AI can perform many routine activities rapidly and efficiently, for making more complex decisions, most AI-based FinTech projects are only at the prototyping stage even in the developed world. Indeed, the AI industry in general has been described as being at an infant stage of development. For instance, in order to ensure that AI algorithms can accurately predict default risks of borrowers, they may need to be trained with information from millions of borrowers. This has not yet happened in most areas including the financial industry in the developing world.

Another challenge that is often highlighted is the shortage of AI talent. A September 2020 report published by the professional services company Deloitte found that even mature AI adopters in the U.S. are facing challenges to recruit the AI talent. The shortage of AI workforce is even more acute in the developing world. Moreover, the adoption of AI by financial institutions may face significant challenges if their board members lack an appropriate level of technological literacy.

AI's possible negative impacts on employment and privacy are other key issues surrounding the use of this technology in the financial industry according to the International Regulatory Strategy Group, which comprises the U.K.-based firms in the financial and professional services industry. AI's negative effects have been the subject of public debate recently. However, developing and developed countries may substantially differ on these issues. Most developing countries have less stringent privacy laws than do many developed countries. Data privacy is thus less of a concern in the developing world. On the other hand, high unemployment rate in developing countries means that financial institutions' deployment of AI may elicit resistance and criticism from regulators and the public.

In sum, AI's ability to make complex financial decisions has not yet been well understood and this technology is also viewed in a negative way due to privacy concerns and the potential for job replacement. However, these challenges are likely to be overcome with the maturity of the technology. Financial institutions can harness the potential of AI to improve efficiency and

reduce various risks, which can lead to low-income people's increased access to financial services.

### **Additional information**

*Nir Kshetri* is Professor at University of North Carolina-Greensboro. He has authored ten books and about 160 academic articles. He has been ranked as the world's most published and second most cited author in research on blockchain in Logistics and Supply Chain Management. Nir was the winner of IT Professional's Most Popular Paper Award in 2020, 2019, and 2018 and Outstanding Contribution in Authorships award in 2020 and 2019. His works have millions of readers. Nir's work has been featured by hundreds of media outlets such as Wall Street Journal, Foreign Policy, Public Radio International, Scientific American, and Bloomberg TV.

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