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COMMENTS OF SUSAN VON STRUENSEE, JD, MPH

to the

Request for Information and Comment on Financial Institutions' Use of Artificial Intelligence, Including  
Machine Learning

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Big data and artificial intelligence for financial inclusion: benefits and issues

This paper discusses the benefits and issues associated with big data and artificial intelligence (AI) for financial inclusion. The discussion shows that there are several benefits of AI and big data for financial inclusion such as: improved efficiency and risk management for financial services providers, provision of smart financial products and services to banked adults, simplification of the account opening process for unbanked adults and the creation of credit scores for unbanked adults using alternative information. Several issues associated with AI and big data for financial inclusion that need to be addressed include: the shortage of skilled AI workers, increased level of unemployment in the financial ecosystem, the unconscious bias in the design of AI systems, and other barriers caused by strict data privacy laws.

**Keywords:** Big Data, Artificial Intelligence, AI, Digital Finance, Fintech, Blockchain, Financial Technology, Financial Inclusion, Unbanked Adults, Formal Accounts, Access to Finance

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### **Conclusion**

I recommend that the Comptroller of the Currency, the Federal Reserve System, the Federal Deposit Insurance Corporation, the Consumer Financial Protection Bureau, and the National Credit Union Administration take steps to ensure compliance in FinTech with the OECD AI Principles, and the OSTP/OMB Guidance on Regulation of Artificial Intelligence Applications. I specifically recommend that the industry limit the scope of defenses for negligent and fraudulent parties whose actions have a legal or significant effect on an individual and discredit the commitment toward trustworthy AI.

Respectfully Submitted,

Susan von Struensee, JD, MPH

# **Big data and artificial intelligence for financial inclusion: benefits and issues**

Peterson K. Ozili

## **Abstract**

This paper discusses the benefits and issues associated with big data and artificial intelligence (AI) for financial inclusion. The identified benefits of AI and big data for financial inclusion are: improved efficiency and risk management for financial services providers, the provision of smart financial products and services to banked adults, simplification of the account opening process for unbanked adults and the creation of credit scores for unbanked adults using alternative information. Several issues associated with AI and big data for financial inclusion that need to be addressed include: the shortage of skilled AI workers, increase in the level of unemployment in the financial ecosystem, the unconscious bias in the design of AI systems, and other barriers caused by strict data privacy laws.

**Keywords:** Big data, artificial intelligence, AI, digital finance, fintech, blockchain, financial technology, financial inclusion, unbanked adults, formal accounts, access to finance.

**JEL code:** O31, O33, G21, G28.

## 1. Introduction

Artificial intelligence (AI) is opening up a new frontier in the field of sustainable development, and is attracting a lot attention among academics and policy makers. The financial inclusion agenda is an important part of the UN sustainable development goals for the financial sector. Yet, there is little knowledge on how AI can accelerate financial inclusion towards achieving the United Nations Sustainable Development Goals (SDGs). What are some of the benefits and implications of AI for financial inclusion? This question is addressed in paper.

I begin by defining the three terms: big data, artificial intelligence and financial inclusion. Big data refers to large data that is so large and complex that traditional data processing methods are inadequate to deal with the calculations needed to make sense of the data (Grable and Lyons, 2018). Big data is high-volume, high-velocity, and high-variety data (Hammer et al, 2017).

Artificial intelligence is the simulation of machines to imitate intelligent human behavior (Kok et al, 2009). In layman terms, artificial intelligence is simply intelligence demonstrated by machines. Artificial intelligence can also be defined as the simulation of human intelligence in machines that are programmed to think and act like humans.

Financial inclusion is defined as the use of formal accounts (Allen et al, 2016). Financial inclusion can also be defined as the provision and use of affordable basic financial services to every member of the population (Ozili, 2018; Ozili, 2020). The first step towards financial inclusion is owning a formal account such as a bank account (Allen et al, 2016).

Policy makers in several countries have embraced financial inclusion as a development priority. More than 50 national authorities have publicly committed to financial inclusion strategies for their countries to ensure that every individual and household have access to formal financial services (World Bank 2013, AFI 2013). The approach used to achieve financial inclusion in each country is non-uniform as policy makers in each country are free to use whichever strategy or method that works for them in achieving financial inclusion objectives.

Some policy makers have announced various tools they wish to use to achieve financial inclusion objectives such as: massive bank enrollment, financial literacy programs, payment system solutions, mobile banking provisions, digital finance schemes. Also, there is optimism that artificial intelligence and

big data will change the drive towards financial inclusion in exciting ways. But so far no government has announced that it will rely solely on big data and artificial intelligence solutions to achieve its financial inclusion objectives. This is because artificial intelligence and big data are relatively new inventions and are still developing. Policy makers don't want to try new things which they are not sure will work. If policy makers cannot reliably predict the benefits and consequences of using artificial intelligence and big data on a national scale, they will not adopt it, at least for now.

To appreciate the value of artificial intelligence and big data for financial inclusion, it is best to view artificial intelligence and big data as another tool that can be used to increase the level of financial inclusion. Taking this perspective makes it easier to understand what to expect from artificial intelligence and big data for financial inclusion. In this paper, I highlight and discuss some benefits and challenges of artificial intelligence and big data for financial inclusion, and offer some concluding remarks.

This paper contributes to the literature in the following ways. Firstly, it contributes to the financial inclusion literature by showing that artificial intelligence and big data can act as tools to increase the level of financial inclusion. It also contributes to the data science literature by showing how data analytics can help to solve development challenges especially in the area of financial inclusion. Three, it contributes to the literature by discussing the potential benefits and issues associated with artificial intelligence and big data for financial inclusion. Finally, it contributes to the literature by offering a perspective for policy makers to think about when assessing the effect of artificial intelligence and big data on financial inclusion objectives.

The rest of the paper is structured as follows. Section 2 presents the literature review. Section 3 discuss the benefits of artificial intelligence for financial inclusion. Section 4 discuss the issues associated with big data and artificial intelligence for financial inclusion. Section 5 concludes.

## 2. Literature review

A number of studies examine the role of data analytics in improving development outcomes. Hilbert (2016) shows that the advent of big data delivers cost-effective prospect to improve decision-making in healthcare development, economic development and security development. At the same time, they point out that big data brings up other problems such as privacy concerns and human resource scarcity particularly in developing countries. Peisker and Dalai (2015) show that the telecommunication sector use data analytics to increase the level of development in rural India. Gamage (2016) argues that big data can improve the role of public sector organizations in the function. Ali et al (2016) review the application of big data analytics for the purpose of human development, and show that big data techniques for development have the potential to revolutionize healthcare, education, and agriculture; facilitate the alleviation of poverty; and helps to deal with humanitarian crises and violent conflicts.

A strand of literature examines the role of big data and AI for financial inclusion. Bazarbash (2019) shows that recent advances in digital technology and big data have allowed Fintech (financial technology) lending to emerge as a solution to reduce the high cost of credit and increase financial inclusion. They show that AI (or machine learning methods) lie at the heart of Fintech lending. Kshetri (2021) show that Fintech companies in developing countries are utilizing digital technologies such as AI to assess, evaluate and refine the creditworthiness of potential borrowers in new and innovative ways. Óskarsdóttir et al (2019) show that combining call-detail records with traditional data in credit scoring models significantly increases the performance of lenders.

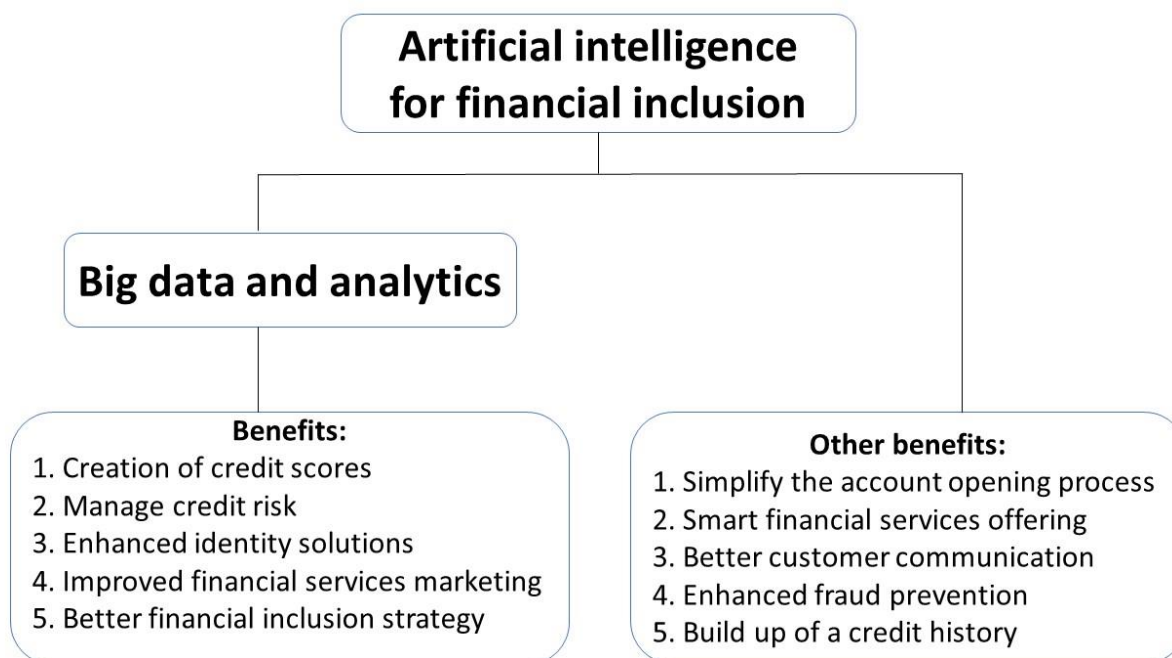
Kandpal and Khalaf (2020) argue that the use of AI in banking leads to a cost-effective and efficient solution to delivering financial services to the financially excluded population. They also argue that big data-driven models can be used to conduct psychometric evaluations to capture information that can help to predict loan repayment behavior, applicants' beliefs, performance, attitudes and integrity. Mhlanga (2020) investigates the impact of AI on digital financial inclusion. The study documents that Fintech companies are using AI and its various applications to achieve digital financial inclusion for low-income earners, the poor, women, youths and small businesses in the formal financial market. The study also finds that AI has a strong influence on digital financial inclusion in areas related to risk detection, measurement and management.

The study also finds that AI addresses the problem of information asymmetry, and support customers through chat-bots.

Agarwal et al (2020) show that lack of credit history is a problem for millennials, and argue that big data and machine learning in Fintech can help to create credit scores for millennials. Hammer et al (2017) identify three challenges with big data namely: data quality issues, data access difficulty, and new required skills and technologies to handle big data. Dirican (2015) argues the robotics and artificial intelligence will increase unemployment in the business environment as businesses begin to hire or buy new robots to automate their operations. Vladeck (2015) shows that the era of big data analytics holds considerable promise for society. But big data and disruptive technologies comes at a cost. One cost of big data is its insatiable appetite for more data. Philippon (2019) finds that big data and machine learning will reduce human biases against minorities, but at the same time, it will erode the effectiveness of existing regulations. Qureshi (2020) emphasize the need for data justice to promote fairness in the use of entrepreneurs' data in big data analytics. Ozili (2019) argue that data analytics innovations, particularly blockchains, are resisted by government authorities for governance and control reasons. Ozili (2019) acknowledges that the on-going blockchain disruption cannot be resisted by governments for too long.

### 3. The Benefits of Artificial Intelligence for financial inclusion

Figure 1 illustrates the benefits of Artificial intelligence for financial inclusion. The benefits are discussed in section 3.1 and 3.2.



Source: author

#### 3.1. Benefits of big data and data analytics for financial inclusion

##### *#1. Big data facilitates the creation of credit score for the excluded population*

Through big data, financial services providers can access 'alternative financial information' such as internet data subscription bills, utility bills, phone bills and other non-bank transaction data. Financial services providers can then use this information to understand and predict an individual's payment pattern for the purpose of generating a credit score for the individual or household. In other words, alternative financial information can be used to create a credit score for people who do not have bank information to build a traditional credit score. This will mostly benefit people outside the formal financial sector, especially the excluded population, who have no banking information. Real life examples include: 'Ciginify' which is an application that uses mobile phone usage data to predict client behavior and then translates the observed



behavior into a credit score. 'Lenddo' is an application that allow users of social media in the Philippines to use their online reputation to qualify for loans.

*#2. Big data helps financial services providers to manage credit risk more efficiently*

Through big data analytics, financial institutions will be able to extract the data of borrowers, analyse the cash inflows and spending pattern of borrowers, and closely monitor borrowers in order to detect early a change in borrowers' ability to repay. This allows financial services providers to predict credit default early so that appropriate measures can be taken to prevent credit default using appropriate credit risk mitigation and management tools.

*#3. Big data provides enhanced identity solutions much better than KYC requirements*

KYC requirements are a barrier to opening formal accounts because they impose an additional cost on financial services providers who need to purchase sophisticated KYC software to conduct customer identification, verification and validation activities (Gardeva, 2012). Big data analytics can solve this problem through innovations that utilize public domain data to confirm an individual's identity on a real-time basis particularly for individuals that do not have a national identification document.

*#4. Improved marketing of financial services*

Big data can change the way financial services providers market the financial services they offer. This can be achieved through data mining. Data mining offers a powerful way to deliver customized advertisement to clients. Through data mining, based on customers' browsing history and media content watch-list history, financial services providers can deliver customized financial products and services advertisements that meet the specific needs of online customers. Google, the world's most powerful search engine, uses this method to deliver advertisement to clients. 'DemystData' uses big data analytics to aggregate public domain data about individuals, and then use statistical analyses to analyse the data into client segment by different criteria, which allows financial services providers to target their advertisement to specific clients (Gardeva, 2012). Financial services providers can utilize this method to target online clients and advertise their financial products and services to them in a convenient way.

*#5. Big data can improve financial inclusion policies and strategy*

Good policies are policies driven by good and accurate data (Hammer et al, 2017). Through big data analytics, policy makers can gather high quality demand-side and supply-side financial inclusion data as well as financial services usage information to support policy and national strategies for financial inclusion. Such demand-side data should also reflect demographic data, spending data, cultural data and economic data.

### **3.2. Other benefits of artificial intelligence for financial inclusion**

*#1. AI can simplify the account opening process for unbanked adults*

AI can facilitate the widespread use of algorithms to automate and simplify the bank account opening process, and eliminate the burdensome documentation requirements that often discourage unbanked adults from opening a formal account.

*#2. AI models can offer customized and smart financial products and services to customers*

AI systems can help companies to offer better products and services to customers based on what the companies know about the customers through their data. Such AI applications will make a big difference for financial inclusion by analyzing people's financial habits, offering them advice and personalized services.

*#3. AI will improve customer service and communication*

The most notable application of AI in the financial sector is in customer service and customer communication. Banks use AI to offer customised offers to customers. Banks also use chatbots to answer customers' questions about banking services and related issues. These services will benefit many customers who live outside major cities because they do not need to travel to communicate with their bank or financial institution.

*#4. AI will help to prevent fraud*

AI can help to prevent fraud by reinforcing customer authentication with many layers of control. This allows for direct verification and cross verification for customers who want to access their data in financial institutions. Also, AI can help financial institutions in their due diligence activities by helping them to

understand the nature and purpose of a transaction. This will help financial institutions to identify early any red-flags that point to fraudulent activities.

*#5. AI aids the build-up of a credit history*

AI applications and systems allow the unbanked population to build a credit history in order to access loans even without having any banking information. AI application and systems use the behavioral attributes of people such as location, contact lists and social media information, and introducing these data into machine learning models which create predictions about the repayment potential of a person (Cuevas, 2020).

#### **4. Some issues**

Several challenges and limitations must be overcome before AI can become a practical tool for promoting high levels of financial inclusion.

*#1. AI may exclude vulnerable people from the financial system.*

Extensive use of AI in the financial system may exclude more people from the financial system. This is not a problem peculiar to AI alone. Rather, it is a problem with technology in general. As the financial system becomes fully digitalized, certain people will naturally become financially excluded. These include elders and people with disabilities. Financial institutions should strive to mitigate the impact of AI on their elderly customers and vulnerable customers.

*#2. AI models, applications or tools have unconscious bias in their designs*

It is important to point that both existing and new AI models and applications will always have some level of unconscious bias in them. The degree of bias may vary from mild to severe in different AI models and applications. The implication is that the models may not fully represent the diverse needs of the unbanked population. Also, such models may not take into account the differences in ethnicity, gender and socio-economic conditions of the unbanked population.

*#3. Loss of jobs or job displacement*

AI when fully introduced may replace thousands of jobs in developed countries by automating repetitive tasks and processes which AI systems can execute within seconds rather than hours or days when such tasks are performed by

humans. But this will come at a cost! It will lead to job loss for employees at the operational level when repetitive processes are fully automated using software or robotics. This will increase the rate of unemployment in the financial ecosystem. This may also lead to resistance by labor unions.

*#4. Fear of handing over decision making to AI systems*

There is an inherent fear of handing over our decision making to AI systems. Acknowledging that even humans can't be 100% right, there is no guarantee that AI will become perfect decision makers. For this reason, critics argue that AI cannot be a pursuit of perfection despite the high quality of execution it brings.

*#5. AI algorithms may not be well trained with sufficient data*

Having an AI algorithm that can perform a task is one thing. Training the algorithm to be efficient and effective when dealing with large volumes of data is another thing. For instance, AI algorithms must be trained with information from millions of borrowers for it to be able to accurately predict the default risk of borrowers (Kshetri, 2021). But the question of ethics will arise. Is it ethical to use real-life borrower information to test or train an AI algorithm? Did the borrower give his or her consent for that purpose? Issues like this will remain a major challenge.

*#6. Shortage of skilled AI workers*

There may be shortage of skilled workers to simulate machine learning algorithms into AI systems. Developed countries already have a shortage of skilled AI workers, and this problem is likely to be worse in developing countries than in developed countries (Kshetri, 2021).

*#7. The Board may not approve the integration of AI into organizational processes.*

The Board of directors are the final decision makers in most corporations. The Board typically approves what they understand. The Board will not approve what it does not understand. Most often, the Board's refusal to approve AI solutions to organizational problems is due to their lack of technological literacy (Kshetri, 2021).

### *#8. Dealing with imperfect data is an issue*

Generally, it is difficult to have perfect data at the primary point of extraction. This is because there may be data reliability issues especially if the data is extracted from many sources that have varying data warehousing methodology and style. Also, data may be hosted in different servers which can complicate and prolong data extraction.

### *#9. Client data privacy and protection issues*

A major concern around big data is the privacy of client information or data. When using big data, the issue of client protection will arise. Therefore, it is important to draw the line on which information is appropriate for financial services providers to use. There will also be questions about whether customers' information is secure in the hands of third party users, whether client approval is needed before third parties can use them, and whether third parties are using customer information only for the intended and approved purpose. These are issues that may be difficult to address. Also, privacy laws may become very strict and prevent AI from achieving its full potential.

## **5. Conclusion**

I conclude by reviewing the main points of the benefits and issues associated with big data and artificial intelligence for financial inclusion.

Several benefits of AI and big data were identified particularly its potential to improve the efficiency and risk management process of financial services providers. AI and big data have benefits for financial inclusion because it will facilitate the provision of smart financial products and services to banked adults, and simplify the account opening process for unbanked adults.

Several issues were highlighted such as the need to train AI algorithms to process very large customer information. Another issue is the shortage of skilled AI workers. Another issue is the concern that AI will increase unemployment in the financial ecosystem. Also, AI models, applications and systems may have unconscious bias in their design, which may lead to financial exclusion for vulnerable adults such as people with disabilities and elderly people. Finally, privacy laws may become very strict and hinder AI from achieving its full potential.

The implication is that, though the era of AI and big data has great promise for society, there are issues that needs to be carefully addressed.

The need to expand financial services to the excluded population has led to the emergence of data-driven solutions that can help to increase the level of financial inclusion. AI and Big data are some options to help increase the level of financial inclusion, but they are not the only option. The AI and big data era will increase the appetite for more data, making it difficult to protect data.

Policy makers that are interested in AI and big data innovations should find a way to balance the benefits of AI and big data with the risks while financial regulators should ensure that AI-led innovations in the financial ecosystem do not transmit instability to the financial system. Academics interested in AI and Big data should identify the ethical boundaries of AI and big data in the delivery of financial services.

Future research can investigate the contribution of blockchain technologies to financial inclusion. Future research can also investigate the cost implications of adopting big data and AI in financial institutions, and assess whether the cost is sustainable in the short and long term.

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