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THE ROLE OF ARTIFICIAL INTELLIGENCE
IN IMPROVING MICROFINANCE PRODUCTIVITY

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Abstract – More than two billion people do not have access to banking institutions, this is where the important role of microfinance distributes small loans to the poor so that they can access the financial industry. This study aims to determine the role of artificial intelligence in improving the productivity of microfinance institutions. The qualitative research was employed with a library study approach by reviewing 25 selected journals indexed by Scopus and supported by Rank 1 and Rank 2 Science and Technology Index journals, with research published in 2000 – 2022. A sample of papers based on keywords in the publication was analyzed using bibliometric with VOSviewer application. The research results stated that microfinance institutions were established to provide benefits to poor and low-income communities. The role of artificial intelligence can increase the productivity of the financial industry. Artificial intelligence can be used to analyze the feasibility and risk of default for customers and potential customers. The advantages of artificial intelligence include speed of decision-making, higher levels of automation for credit decisions, and the ability to be used remotely. In addition, artificial intelligence can also be used to generate investment signals that grow exponentially and generate data for future analysis.

Keywords: artificial intelligence, microfinance, productivity.

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I. INTRODUCTION

This currency system of transactions by exchanging goods emerged in the Neolithic era, or during the farming period. The people of Mesopotamia used this system around 6,000 years before Christ [1]. Until around 546 BC, metal money was discovered by Croseus in Greece, and then the first discovery of paper money in China was in 977 AD [2]. Money continues to develop from time to time until now, with the discovery of digital money and crypto money [3, 4]. Digital money has been considered one of the biggest contributors to financial inclusion over the past decade [5]. The expansion of the financial sector persisted, but at a certain point, money alone ceased to stimulate economic growth effectively. Consequently, around 1394 AD, the banking industry emerged as a strategic initiative to bolster economic expansion [6]. Many countries quickly picked up on this idea, and having banks made a huge difference in how fast their economies grew [7]. However, not all communities have access to banks, especially rural communities, due to small transaction volumes and low income. The results of research conducted by Kitomari et al. [8] mentioned that banks often marginalize the urban and rural poor in various lending initiatives, hence the establishment of microfinance institutions to serve the unbanked [9].

The technology industry continues to evolve with the aim of simplifying and streamlining and then came the birth of what is called artificial intelligence (AI). AI is all in business, especially in the financial sector. It is aimed at driving economic growth through increased efficiency and productivity [10]. A combination of technological innovations, including AI, is transforming

business as it responds to volatility, uncertainty, complexity, and ambiguity in the world’s financial sector [11]. AI is ‘trying to make computers do things that the mind can do’ [12]. The origins of AI are often traced back to the mid-20th century on the three laws of Robotics Games and Computers when AI developed rapidly. Its growth is driven by a series of technological and market factors [13].

Research conducted by Prameela [14] states that about 300 million to 360 million are in ‘absolute poverty’ and that more than 2 billion people do not have access to banking [15]. This is where microfinance plays an important role in distributing small loans to the poor so that they can access the financial industry. Microfinance is defined as a development tool that delivers or provides financial services and products such as very small loans, savings, and insurance financing to assist very poor people in developing or setting up their businesses and mostly used in developing countries where small and medium enterprises (SMEs) do not have access to banks [16]. This paper examines how digital technology or AI can play a role and contribute to the productivity of the financial industry.

II. RESEARCH METHODS

The type of research used is qualitative research with a literature study, library research (library study) approach using a review, researchers focus on the selection of topics or keywords, as suggested by Chen et al. [17]. Keyword selection is carried out using a top-down technique, starting from a broad keyword search to study and investigate a general topic and then narrowing it down to be more specific. To help researchers study the relationship between keywords, topic mapping was carried out using the VOSviewer application and Publish or Perish (PoP) application [18].

In the initial stage, an article search was carried out using keywords and synonyms, namely ‘microfinance’, and ‘artificial intelligence’, in the Publish or Perish application, 975 related articles were found from the 1000 articles search, and

the selected article documents were revised based on title, abstract, and keywords. First, articles from journals that were published between 2000 and 2022 were chosen. Next, journals listed in Scopus with rankings from Q4 to Q1, or those recognized by SINTA (Science and Technology Index) ranging from Sinta 2 to Sinta 1 were focused. All selected journals are available online through Science Direct and Google Scholar.

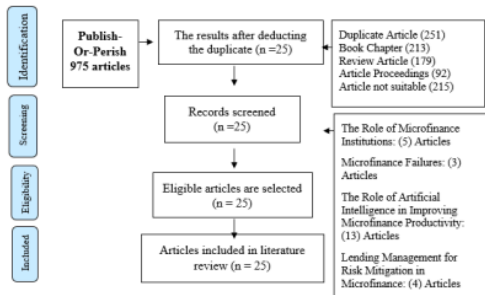


Fig. 1: Method for searching the literature review

A total of 975 searches were conducted using the keywords ‘microfinance’ and ‘artificial intelligence’. After removing duplicate articles, the remaining results consisted of 251 duplicate articles, 213 book chapters, 179 article reviews, 92 proceedings articles, and 215 inappropriate articles. Among these, 25 articles published between 2000 and 2022 were chosen to specifically represent the phenomena related to the research topic of interest.

The 25 journals collected represent various situations in many countries, such as developed countries in Europe as well as developing countries, Indonesia, Nigeria, and India, as illustrated in Figure 1.

Furthermore, the 975 data found using the Publish or Peris applications were then saved in Ris format, then processed using VOSviewer.

Analysis with the VOSviewer application shows three clusters with red, blue, and green colors (Figure 2). In the red color, the words that appear the most are ‘analysis’, and ‘artificial

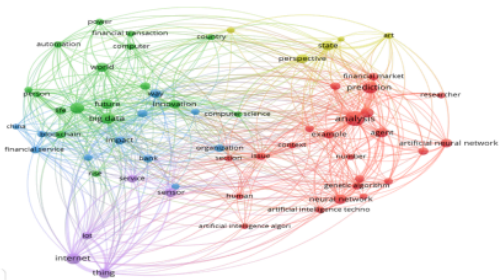


Fig. 2: Bibliometric analysis of microfinance research

intelligence’; while in the blue cluster are ‘financial service’, ‘microfinance’, and ‘bank’; and ‘blockchain’, ‘robotic’, and ‘big data in the future’ in belong to the green cluster.

Based on the results of VOSviewer in Figure 2, it can be seen that research regarding the relationship between the variables ‘microfinance’ and ‘artificial intelligence’ is currently still very little, even almost non-existent. Therefore, it is important to involve variables that are rarely involved in previous research to produce new findings.

III. RESULTS AND DISCUSSION

A. The role of microfinance institutions

The establishment of microfinance in Nigeria was motivated by the inability of the Bank of Nigeria to provide adequate financial services to the rural poor [19]. Microfinance has taken up the challenge of the gap. Microfinance was established to benefit low-income earners [20].

The quality of infrastructure connecting rural and urban areas tends to be low, resulting in expensive travel costs to make secure deposits. Similar cost savings and efficiencies have been found when other types of government payments are issued digitally [21]. Microfinance provides funds to the urban and rural poor who do not have access to capital from banks, and microfinance was established to promote financial activities especially savings and credit in the community. Microfinance activities are focused on reducing

the poverty levels of the disadvantaged, marginalized, and underprivileged [9].

Three things distinguish microfinance from other formal financial products. These include offering small loan amounts, not requiring collateral, being easily accessible to the impoverished, helping the poor become familiar with investment products, and providing opportunities for the poor to improve the quality of nutrition and better nutrition for the welfare of their children and the economic and social empowerment of women [22].

B. Learning from history (microfinance failures)

VICOBA is a microfinance institution located in Arusha Tanzania established in September 2002. VICOBA is a grassroots-based lending model, that focuses on developing participants’ ability to innovate and manage viable income-generating activities set up specifically to empower women. The VICOBA model begins with groups of five members coming together to form larger groups of 30. The formed groups are then registered and facilitated to create their bank and schedule of training activities [23]. Each group has 30 members consisting of a chairperson, secretary, treasurer, and person in charge. They provide overall supervision, group trainers provide overall guidance to the group, and in cooperation with the chairperson, group members are required to attend weekly meetings as decided by the group. Moreover, each group has a cycle determined by the group of about 12–18 months. In the end, the dividend is shared among the group members.

The VICOBA concept was initially successful and adopted in many countries, with over 1876 groups reportedly operating with 56,280 members, until the concept faced problems and bankruptcy [24].

The first cause of the system’s collapse was that members complained that the repayment period was too short for borrowers to pay on time, making them prone to default as most VICOBA repayment periods are 1–3 months. Secondly, many VICOBA members have many dependents

in the family, ³ so the loan obtained from VICOBA acts as the only source of income in the family.

The third is family conflict. When a family experiences conflict, it hinders economic activities, leading to poor business performance and subsequently resulting in low rates of loan repayment. The third factor is familial discord. The fourth is the high interest rate, then the fifth is the lack of training in business management skill³ that was promised at the beginning. The sixth problem in VICOBA is the dominance of many poor people with unstable sources of income. The last reason is that many group members dream of becoming successful businessmen in just one night so they join more than one group, thus having multiple memberships, moving from one group to another. After defaulting on loans they migrate to other villages to avoid the embarrassment of defaulting [25].

C. The role of artificial intelligence in improving microfinance productivity

Ten years ago, management information systems (MIS), online lending, and the use of mobile banking were common topics mentioned in discussions about advanced technology for the microfinance industry [25]. More recently, microfinance institutions have used credit scoring to improve the productivity of their loan officers and expand financial inclusion. Credit scoring now uses online data points collected from social networks to determine whether a potential borrower is safe or at risk [26].

In Europe, the finance industry uses data from Facebook and LinkedIn to assess the risk profile of potential customers, as observed in platforms like Kreditech or ID Finance. The use of data from social media for credit scoring in developing countries may start with Lenddo companies operating in the Philippines and Colombia and then expand overseas. There is also an African company called MyBucks which is based in Luxembourg and listed on the Frankfurt Stock Exchange, operating in African countries, which is making consumer behavior change from cash transactions and switch to digital transactions.

This data analysis helps Miko financial institutions [27]. The lucrative nature of the industry has led companies like Kreditech or ID Finance to expand from Europe to emerging markets in Latin America and Asia. Take ID Finance, a company headquartered in Spain that originally started in Russia and is now in nine countries. It is already profitable and generated \$6.5 million in 2017. It has nearly one million customers, its bad debts have gradually dropped to less than 10%, thanks to AI [28].

² Technology speeds up the loan process by making better decisions about potential customers, automatically calculating affordability and likelihood of default, even for customers with no formal credit history and no bank account. The customer installs the app on his/her phone, and the lender can use the information on the customer's phone and browser to estimate the risk and disburse the funds within minutes if approved. No humans or documents are required, therefore, operational costs are very low [29].

Three important differences between digital credit systems compared to traditional credit systems include fast decision-making speed, higher levels of automation for credit decisions, and the ability to be used remotely. The use of appropriate financial services systems such as microfinance or cooperative finance can drive inclusion so that the poor can access technology [30]. Service finance can provide financial support for technology, while technology itself facilitates the provision of swift financial services. One of the social innovations in financial services is microfinance, the provision of small amounts of credit and other financial services to poor and marginalized communities [31].

Apart from that, AI can also be used to produce investment signals that grow exponentially (30) both in the stock market, financial markets, and other financial instruments, to increase the income of microfinance institutions in the form of other income [32].

¹ The study explores the relationship between technology and financial services which has grown exponentially over the past few years [33].

Table 1: The role of microfinance in transforming rural areas

No.	The role of microfinance in rural area transformation	
1	Investment opportunities	Most microfinance has investment services such as time deposits.
2	Savings mobilization and lending	Collecting and distributing funds will increase economic circulation in rural areas.
3	Asset financing	Help customers acquire some needed assets by paying over a period of time.
4	Improved standard of living	With empowerment, they can set up small businesses they will be able to take care of their family members expand their business to employ more people.
5	Illiteracy problem	High levels of illiteracy affect the recording and decision-making abilities of borrowers and consequently affect their relationships with banks.

Source: Nwankwo et al. [19]



Fig. 3: Public interest in fintech versus microfinance

Source: Google trends (2024) processed by the Authors

Google Trends was used to compare interest in microfinance with fintech. Figure 3 shows that relatively few searches were made for fintech eight years ago. However, after February 2022, public interest in fintech was greater than in microfinance. The yellow line at the bottom shows microcredit interest, and the red line shows microfinance. Fintech has attracted the interest of online media and the public and has taken over microfinance, but microfinance is still as attractive as ever. This could be because fintechs are attracting wider commercial interest.

Figure 4 provides a conceptual perspective derived from press reports found in Europresse’s offline and online media reports database. This perspective may be biased for other research on microfinance as it includes some large operators such as (banks, tech companies, and telcos) and

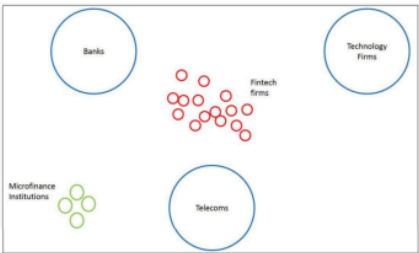


Fig. 4: Microfinance marginalized [27]

many small fintech companies that are eating into their business [34]. Several large operators will eventually buy this fintech company. Microfinance companies stand on the sidelines, aspiring to become banks and partner with telecoms to grow big in developing countries, but are ignored by developed world financial media.

D. Lending management for risk mitigation in microfinance

To change the dynamics to reduce credit risks among the more marginalized groups overlooked by traditional and microfinance loans in Figure 5, supportive policies are provided [35]. Shared microloan programs are one of the ways to address the credit risk issues that microfinance faces. In short, by making neighbors mutually liable for each other’s debts, the occurrence of defaults between lenders and borrowers will be minimized. Since borrowers under joint liability loans know each other and are often physically close, the assumption in the canonical model is that there are no, or at least limited, information asymmetries between them. Since most joint liability programs allow borrowers to form their groups, the theory suggests that rational borrowers will exclude high-risk individuals from their groups and avoid adverse selection problems [36].

The capacity to utilize nontraditional forms of social collateral to deter capital misdirection hinges on the principle that individuals seen taking advantage of their peers may face ostracism

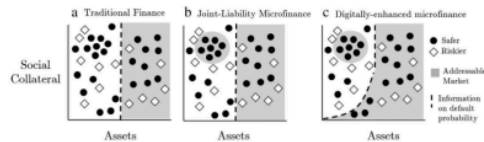


Fig. 5: Lending risk mitigation [32]

from regular social engagements by the aggrieved parties in future instances. This concept, known as social collateral or social capital, posits that the threat of being excluded from valuable social interactions acts as a deterrent against opportunistic behavior, encouraging individuals to safeguard their social collateral to prevent foreclosure on physical assets. However, empirical evidence regarding the effectiveness of microfinance in mitigating risk through this mechanism has been mixed at best. Recent studies, including research by Flatnes et al. [37], indicate that incorporating a minimal level of personal collateral within co-borrowing arrangements could serve to curb morally hazardous conduct more effectively.

The schematic in Figure 5 illustrates that the horizontal axis measures the tangible collateral assets that formal lenders can accept. The vertical axis captures intangible types of social collateral. Traditional, long-term lending shown in Panel (a) illustrates that without the ability to observe or predict risk, lenders rely on high collateral which rations borrowers with inadequate tangible collateral assets. Panel (b) illustrates how joint liability microfinance allows lending to a group of low-income individuals who are known and trusted by the co-borrowers to be responsible for repaying the loan because they know the likelihood of repayment, and Panel (c) can socially penalize them (confiscate their social security) if they try to divert credit during the term of the loan. As shown, joint liability can expand access to capital for some low-wealth individuals, but only for those who are well-known enough and have strong enough social collateral to control the diversion of resources.

IV. CONCLUSION AND RECOMMENDATIONS

The establishment of finance was motivated by the inability of banks to provide adequate financial services to the rural poor. Microfinance was established to benefit the poor and low-income. Three things differentiate microfinance from other formal financial products: the loan amount is low, has no collateral, and is easily operated by the poor. The role of AI is clearly able to improve the performance of the financial industry, and the use of AI can be technically used to analyze the feasibility and risk of default for customers and prospective customers. Important differences between digital credit systems compared to traditional credit systems include fast decision-making speed, higher levels of automation for credit decisions, and the ability to be used remotely. In addition, AI can also be used to generate investment signals that grow exponentially and digitally generate data for future analysis.

Microfinance institutions are still unable to use AI due to limited costs and lack of resources, therefore, microfinance institutions can adopt the following strategies, including (1) collaboration strategy, namely collaborating with parties who oversee AI, and (2) the strategy of strengthening human resources and product innovation.

Finally, financial institutions must also pay attention to the challenges faced by Islamic banking in developing their business [38]. The first is the customer mindset. There is still an impression in some communities that Islamic banks are exclusive or only involve the Muslim community. The second is regulations to create an investment climate in the Islamic industry that is still less flexible, tax regulations, and the growth of new products and services that have not been fully supported. The third is about limited human resources to understand technology and residents in remote villages, as well as understanding Islamic products and systems. And the last is still the lack of capital owned by Islamic banking and financing institutions.

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