Artificial Intelligence Applied in Banking for Inclusion of Unbanked Population

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[Abstract] Financial inclusion talks about the availability of basic banking products and services to an unbanked population. Many policy decisions and regulations have been formulated for rigorous financial inclusion, and now the next level is happening by involving technology to make available banking services to mass populations. The banking sector is exploring technology to exploit the available opportunities. This research work focuses on major banks' initiatives towards financial inclusion by using products and services based on artificial intelligence (AI). This research work considers the top five banks that are the part of NIFTY index. Research findings suggest that the major use of AI is in form of chat bots, loan appraisals, risk management, credit assessments, bank enquiries, product applications, payment transfers, ATM-related services, and personalized offers. This research work also may be a contribution to retail customers; it may, as well, assist policy makers and bankers in applying artificial intelligence tools to enhance financial inclusion.

[Keywords] artificial intelligence, banking, financial inclusion, services, technology, unbanked population

Introduction

The banking industry is considered as the pillar of every economy. Various governments produce many policies and decisions for making financial and banking services accessible for individuals. Much of the population is unbanked in the world. (João Jungo *, Financial Regulation, Financial Inclusion and Competitiveness in the Banking Sector in SADC and SAARC Countries: The Moderating Role of Financial Stability , 2022) It is estimated that around 1.7 billion adults are not able to access banking services; this is a bitter truth. Statistics state that around the U.S., 33.5 million households are in either the category of the under-banked or unbanked. These individuals have major issues with financial literacy and criteria and have less ability to get services from banks. This is one of the major causes of poverty for the population, as it remains in a dearth of credits and savings. About 190 million in India's adult population do not even have a basic bank account, as reported in the Global Findex Report 2017 (PRUTHI, 2018) and the database of the World Bank's Global Financial Inclusion. After China, India is the world's second-largest country as measured by the number of unbanked individuals and financially excluded population. This statistic is in the situation when India and China have high account ownership but in sheer size (VERMA, 2021). It can be observed form the above statistics that whether it is a developed or developing economy, all nations have the common problems with financial inclusion and mass penetration and accessibility of banking and financial services to population. (Malali, 2020).

To accelerate the penetration of financial and banking services to urban and rural areas, technology is used. Now we are in the age of artificial intelligence and industry 4.0 in which technical expertise is assisting businesses to go to the next level of growth, penetration, and achievement of efficiency. Technology is accelerating banking services in unserved communities. (Fintech drives financial inclusion in Latin America, 2022) It is found that there are numerous methods of assistance that we can get from artificial intelligence and big data to achieve financial inclusion, like risk management, enhanced competence, availably of smart financial products, and services for the unbanked adult population (such as simple and easy ways of opening bank accounts, creation of credit scores for the unbanked by accessing

alternate data, etc.) (Ozili, 2021)Artificial intelligence is making banking and financial institutions powerful by utilizing technology and redefining the way they used to operate to achieve more efficiency and growth (Dr.Anil B Malali, 2020).[Financially excluded people can be connected to formal banking and financial services after utilizing AI applications. Cost-effectiveness, security, customization, and speed are the characteristics and qualities that can be achieved with AI implementations. This research work basically emphasizes the applications of AI for financial inclusion (T. Ravikumar, 2021)

This research work aims, first, to comprehend the notion of artificial intelligence and its applications for the banking and financial industries. In the second half of the work,, research focuses on the banking data to discuss the application of AI. The last part of the paper discusses how AI can be used to convert the unbanked population into a banked population. One significant facet of this is in the way artificial intelligence could support the banking and financial industries**,** especially in the arena of financial inclusion.

Review of Literature

The researchers reviewed the available literature regarding use of AI in the banking industry to improve financial inclusion in India from various databases like ProQuest, Taylor and Francis, IEEE (CSDL online), Google scholar, Research gate, and Science Direct. The following is the summary of the review of literature. (N. Murugan, 2021) Focuses on use of AI for the financially excluded population in the research work. It further highlights the benefits that can be achieved by AI implementation. The paper states a few of the benefits, like cost-effectiveness, speed, customization, and security. The paper has examined role of AI to boost financial inclusion in India by utilizing AI-driven financial solutions. The paper focused on the transition in the banking sector by use of AI enabled robots, mobile banking, chatbots, etc. (Artificial Intelligence and augmented intelligence collaboration: regaining trust and confidence in the financial sector , 2018)This research work uses doctrinal sources and a case study to indicate that lot of the banking sector and FinTech start-up companies are investing in AI. AI is gradually becoming well accepted in the financial and banking sectors because of its capability to make available to consumers personalized services, cost effectiveness, and competence. There are challenges, like the lack of trust among consumers, and there is an observation that discrimination is there against certain races and gender.

Prospect of Artificial Intelligence in inter-disciplinary Aspect

(Hicham Sadik)The paper has reviewed how AI can be used for credit analysis. Creditworthiness assessments can be done with AI models and combined with the growth of computing power to make new sources of information, like big data, accessible. If artificial intelligence is combined with big data, then weak signals can be also captured; it may be the practice of interactions or non-linearities between explanatory variables that appear to yield prediction improvements over conventional measures of creditworthiness. The main challenge faced by AI-based credit analysis processes is that it raises enduring apprehensions because of probable prejudices and legal, regulatory problems and ethical issues (Nishi Malhotra Pankaj Kumar Baag, 2022). The research paper has reviewed the impact of PMJDY on FI in India. The researchers have analyzed the demand side and supply side factors in achieving financial inclusion in India. The finding of the research is financial access is mainly affected by education and behavior, age, and income impact of FI. The paper highlights the need for financial literacy (João Jungo *, Financial Regulation, Financial Inclusion and Competitiveness in the Banking Sector in SADC and SAARC Countries: The Moderating Role of Financial Stability , 2022).

The paper has analyzed the role of financial regulations on the effectiveness of financial inclusion of 23 countries over the period of 2005 to 2018. The policy makers should balance financial regulations and stability (Mhlanga, 2020). The paper has investigated how AI applications have helped in achieving digital financial inclusion. The author has recommended that financial and non-financial institutions and the government should use AI tools and applications to ensure vulnerable groups of people who are not financially active do participate in the formal financial system with a minimum number of challenges and a maximum number of benefits (Nair & Jain, 2022). The author has developed a framework of an electronic delivery system that can be implemented to connect with rural citizens by government use of banking

infrastructure. The author has come out with challenges that banks are facing to implement the broadening of financial inclusion (Kateryna Kraus & Shtepa, 2022). The authors have focused on the main aspect of cyber security in the current global challenges of hacking and cyber threats while enhancing financial inclusion; cyber security plays a prominent role (Fintech drives financial inclusion in Latin America, 2022). The article focuses on how technology has helped Latin America with financial inclusion. New markets for financial services are created by demographics and technology, which was long ignored by traditional banks. Fintech start-ups are driving the market and inclusion of untapped. (João Jungo *, The Effect of Financial Inclusion and Competitiveness on Financial Stability: Why Financial Regulation Matters in Developing Countries? , 2022). The paper carried out a study about how FI has impact on financial stability and the role of financial regulations in the developing economy (Kshetr, 2021). The paper focuses on how AI will help overcome the challenges faced by the traditional banks in FI. Traditional bankers are reluctant to serve low-income people and small borrowers, as the transaction cost is high, and it is an inefficient process. The abilities of financial institutions to score credit poor customers can be improved with credit scores that can be calculated using ML. Even for anti-money laundering (AML) and knowing your customer (KYC), AI can be deployed. To manage risk underwriting, AI can be utilized for the back office.

Research Gap

After going through the available literature, it is observed that the study has been carried out regarding usefulness of AI in FI in the banking sector. The specific AI tools applied by various banks from India are not studied. The researcher has explored various AI tools used by banks in India and given suggestions to enhance FI by overcoming challenges in the use of AI.

Research Methodology

The main aim of this research work is to investigate the role of artificial intelligence in promotion for financial inclusion in India. This research work is basically based on secondary data evidence that address how artificial intelligence has been used and can be used a way for the conversion of the unbanked population to a banked population. The researchers have referred authentic sources of secondary data like reports, journals, and websites. The secondary data collected is analyzed to identify the role of artificial intelligence in encouraging financial inclusion. The research work focuses on five banks that are actively using artificial intelligence to examine the role of AI in the banking and financial sector. For selection of the banks for the research work, the Bank NIFTY Stocks are considered. The top five banks according to the weight and CMP (current market price) are considered.

Figure 1

Bank Nifty Stocks (Fact, 2022)

LIST OF BANK NIFTY STOCKS

COMPANY NAME	WEIGHT	CMP	PRICE CHANGE	MARKET CAP (CR)	52W HIGH	52W LOW	ROE	P/E	P/B	EBITDA (CR)
HDFCBANK	27.04%	1355.35	+7.80 (+0.58%)	748604.58	1725.00	1271.60	16.69	19.48	2.99	29180.56
ICICIBANK	23.03%	774.55	+2.55 (+0.33%)	537045.33	867.00	639.10	14.85	23.01	3.21	21236.46
KOTAKBANK	11.72%	1840.00	-5.65 (-0.31%)	366441.68	2253.00	1626.00	13.12	42.74	5.09	7989.72
SBIN	11.27%	494.00	+3.70 (+0.75%)	437573.71	549.00	401.25	13.61	13.81	1.70	53800.55
AXISBANK	11.18%	695.80	+11.30 (+1.65%)	210240.53	866.90	618.25	12.77	16.14	1.83	15063.98
INDUSINDBK	5.58%	849.50	-1.55 (-0.18%)	65965.11	1242.00	763.20	7.55	14.30	1.39	5791.61
BANKBARODA	1.84%	110.55	+2.55 (+2.36%)	55850.71	122.70	72.50	8.37	7.69	0.65	11964.76
FEDERALBNK	1.68%	104.25	+1.25 (+1.21%)	21667.94	107.65	77.50	11.00	10.21	1.15	2966.16
IDFCFIRSTB	1.08%	34.85	+0.05 (+0.14%)	21642.42	53.70	28.95	0.57	145.00	1.03	2353.2
PNB	0.91%	31.45	+0.10 (+0.32%)	34519.53	48.20	28.05	4.44	10.02	0.39	11965.51

The Case Companies

It has been observed that the banking sector in India is regulated properly and far ahead. The following data is extracted from the report:

Assets of Public Sector Banks (2020)	US$1.52 trillion
Growth of Bank Credit at CAGR (2016-2020)	3.57%
Total Credit extended	US$ 1,698.97 billion

From the above data, it is clear that India's banking ecosystem is growing. Thus, adoption of AI will progress, which will support digital banking platform (Kumar, 2021). The following segment provides a brief profile of the bank cases used in the study. Information presented below was obtained from the websites of the banks, annual reports of the banks, and from articles available on the web.

State Bank of India (SBI)

In India, the data shows that State Bank of India (SBI), a public sector bank, plays a major role in providing banking services. It has various unique banking products and services. It applies the latest technology by providing and managing them in a personalized and customer centered way. The bank has achieved this place in the market by applying artificial intelligence, machine learning (ML) and data analytics.
The bank has developed and is using the following models of AI:

- Project Shikhar (Credit card issuance model)
- Digital instant loan via Yono
- Yono Krishi app-based lending
- Branch footfall reduction
- ATM winback (T. Ravikumar, 2021)
- SBI Intelligent Assistant (SIA)
- AI-powered smart chat assistant

Customer inquiries are addressed instantly by a smart chat assistant and SIA, which helps them with day-to-day banking work, which is performed by humans. A smart chat assistant is developed by Payjo. It can address 10,000 inquiries per second or 864 million in a day. By volume, it is approximately 25% of the queries which Google processes per day (Kumar, 2021). The bank has specifically developed an innovative app, YONO. It helps in serving customers' banking and other needs. It consists of YONO Cash, Business, Quick Pay, and Pre-Approved Personal Loans. Lifestyle and shopping options from 111 merchant partners are also provided. It provides progressive digital services to retail customers, farmers, corporate clients, and customers of select overseas offices in the millions. The objective is to increase dissemination and push customers into adopting technology; the YONO Lite app has been available in twelve Indian languages, and the Yono Krishi app is available in ten Indian languages. With the aim to have same underwriting standards in processing loans, the Retail Loan Management Solution (RLMS) and Vendor Verification Module (VVM) were implemented by the bank. Customers are using it smoothly by connecting with the bank.

The following records are set by YONO app (31st March 2022):

- Downloads 111.74 million,
- New digital Savings Bank accounts per day 26K
- Registered users 48.35 million.

Thus, analytics has been applied at SBI to lower the barriers for adoption of digital banking (SBI, 2021-22).

Housing Development Finance Corporation Limited (HDFC)

HDFC has also adopted AI and developed technology to deliver services in banking and financial sectors. The bank has developed and applied the following AI-based applications:

- Eva
- OnChat
- End-to-end digitally enabled product

A smart chatbot called "Eva," which functions with Google Assistant to answer customers' enquiries, queries and gives HDFC customers personalized facilities on Android devices. Eva has been developed by Bengaluru-based Sense forth AI Research. It has answered over five million user queries with more than 85% accuracy. OnChat was launched on Facebook Messenger in 2016. Money transfer, bill payments, cards, loans, and mortgages are the functions carried out by applying AI. (Kumar, 2021). The bank is also applying AI in business alignment; end-to-end data workflow, skills, and competency mapping (T. Ravikumar, 2021). The bank is focusing on use of AI and machine learning tools that are helpful in the growth of business, managing risk, and enhancing efficiency in the process. The life cycle of retail loans has been digitalized by predictive and prescriptive models by the bank. By applying unified data layer, behavior across customer life cycles, a 360-degree view has been facilitated. Better customer expectations management is the main aim (HDFC, 2020-21).

The bank has automated its loan process, which is useful in smoothening loan origination and processing controls. The information can be fetched from government portals like GST, Ministry of Corporate Affairs, and Income Tax. It can also be collected from bank statement information analyzers. Fintech platforms are also developed for the application programming interface (API). As a result, 81% of borrowers were digitally on-boarded during the year. End-to-end digitally enabled products are developed to have all checks and controls, which are system driven, and loans are auto approved (HDFC, 2020-21).

Industrial Credit and Investment Corporation of India (ICICI) Bank

In private sector banks, ICICI is known for its large-scale operations. It is offering various financial products and services to retail, SME, and corporate customers. The bank is using AI in lending, loan assessment, predictive analytics, and digital presence, algorithms, and data points very effectively. AI is useful to identify the creditworthiness of a borrower without a credit score.

ICICI Bank is applying the following AI based tools:

- iPal (ICICI, 2022)
- Funding of electronic Negotiable Warehousing Receipts (eNWR)
- Mobile app, "Mera iMobile"
- Software robotics (Jha, 2018)

iPal is an omni-channel bot that enhances customers' experience of banking. It assists in financial functions like inquiries, product application, information about branches, and ATM-related services virtually (ICICI, 2022). ICICI Bank has introduced funding of electronic negotiable warehousing receipts (eNWR). This facility helps borrowers get credit quickly and easily. It is very useful to farmers for loans on the basis of commodities. For rural customers, a light version mobile app, "Mera iMobile" has been created in 11 regional languages and 135 services. The main feature is that various functions work without internet access. The outcome of "Mera iMobile" app is as follows:

- Usage: half a million customers.
- The rural banking portfolio grew by 26.9% year-on-year during fiscal 2021 to ₹721.58 billion (report, 2022)

Software robotics were implemented on a large scale for first time in India and in very few organizations globally by ICICI in 2016. There are 200 software robotics performing 1 million transactions daily. The target of the bank is to scale its RPA initiative to more than 750 software robotics, handling approximately

2 million transactions daily, which is 20% of the transaction volumes. (Jha, 2018)

Axis Bank

With a 20-million customer base and expectation of substantial growth, Axis Bank is the third-largest private-sector bank in India. The bank has implemented an AI-based chatbot with an objective to enhance customer service quality and costs (Axis). The bank took various important steps for providing good AI-based and non-AI-based services to customers in late 2016 and 2017. These are as follows:

1 A customer Self-Serve Q&A Platform, a manual chat service
2 Improvements to the existing interactive voice response (IVR) system at the call center
3 AI Chatbot implementation called Axis Aha!.

To answer inquiries of customers in huge numbers, the AI chatbot is utilized effectively. RPA solutions are used for credit assessment to accounts payable and account reconciliation to fraud prevention (Bundela, 2019). As a result of this, the bank has been able to reduce the turnaround time on savings account opening by about 90% (Rajiv Anand). The bank has focused on digital banking and the Axis Virtual Centre (AVC); the outcome there is a remarkable increase of granular deposits. It has implemented a tool, Emergency Savings Planner (ESP), which helps customers calculate their emergency corpus and build savings habits. It also assists in reaching the final corpus in a stipulated period (Report, 2020-21).

Kotak Mahindra Bank

To resolve the various queries in banking, AI-based chatbot Keya has been implemented in 2019 by Kotak Mahindra to give quick service to millions of Kotak customers 24*7. It is a bilingual voicebot associated with a phone-banking helpline and will enhance the traditional interactive voice response (IVR) system (T. Ravikumar, 2021) The bank's Keya chatbot is available on the website for internet banking. To redefine customer's experience, the bank has applied human intelligence with machine learning (Active.Ai, 2019). By applying human-based and AI-based solutions, the bank is doing great where customers require handholding, such as for digital branches, automated tellers, home loan origination, and biometric account opening. All digital platforms are utilized to make the bank services available, such as WhatsApp, missed calls, chatbot, voicebot, mobile app, and kiosk (Bank, 2020-21).

Major utilization of AI in the Indian Banking sector

Chatbots: Nowadays chatbot's are used by banks and Fintech companies to solve customer inquiries, questions, and doubts. Chatbot's are assisting banks and financial institution to address the customer's issue 24x7.This is assisting service providers even to extend their services to remote locations, and customers do not need to physically visit the banks. It is extending the banks communication to banked and unbanked populations.

Prevention of fraud: Artificial intelligence assists banks by the reinforcing customer verification, additions to new layers of control, and governance. For examples, it is assisting in comparing the photos mentioned in documents to the real-time photos. AI fetches the prospect of understanding the nature and objectives of the transactions and analyzing it to understand if it matches with the client's profile and spending patterns. It assists the financial organizations to execute due diligence through each transaction, even safeguarding vulnerable individuals against cyber-attacks.

Credit Scoring: Credit scoring is also one of the services that can lead to include the unbanked population to be part of banking and financial services, as these individual were not capable to make evidence for the earnings or credit history because they are, typically, cash-intensive users. Most of the time, banks ask for the past income records before extending the services, like debit or credit cards, loans, or mortgages. At present, new consumers can use those products in their routine life, constructing in the background a credit history that would be utilized as the most important pointer, to acquire access to loans or mortgages in the future. It creates opportunity for building the prospect to get the unbanked population in the future with access to credit lines.

Access affordable loans: As artificial intelligence assists in building the past credit history for the unbanked population, so it helps in getting access to affordable loans to those per their capabilities. Utilizing behavioral attributes makes things accessible for everybody, such as contact data (contact number lists, localities), social media information, bills, spending patterns, and interests and introducing them to machine learning models, which generate forecasts about the possibility of reimbursement of individuals. Several corporations also comprise, as part of their analysis, the usage of digital wallets, the spending patterns and prepaid cards to produce custom-made credit offers.

Better Customer service: Banks are focusing on artificial intelligence to provide better services to the customers and improve customer experience. Banks are able to provided services and product in the location where they are not physically present. Many customers are able to access all the information at their fingertips by using AI-based tools implemented by banks.

Financial Education: Artificial intelligence also assists in gaining financial education for the customers, as bank and fintech can proceed in a consultative role for their clients, providing tools that permit them to achieve their financials goals and objectives, educating and identifying them about the patterns that can lead to liquidity problems and insolvency and also by advising and educating them to save money as regular habits.

Findings

Digitalization has totally changed the business landscape in all industries. Hence, the banking sector is assessing various options to create value in the technology-driven world. AI-based solutions and machine learning are rapidly bringing political, social, and economic transformation that can be called game changers. Traditional banking could not reach financially excluded people. The most important application of artificial intelligence tools is financial inclusion by reaching the unbanked population. To achieve sustainability in finance in the age of Industry 4.0, we depend upon big data, social media, and data science. It was very difficult to serve low-income people using traditional banking methods, as the cost was high and the process was inefficient. In this technological era, it is easily possible to reach out to the unbanked people and serve them.

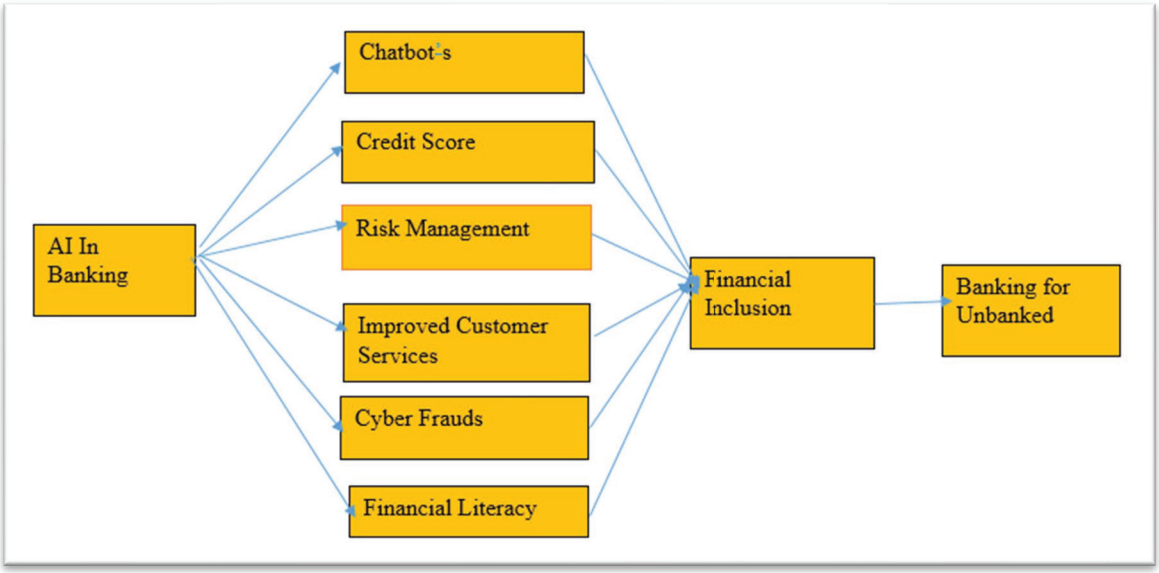
It is observed that banks are using AI for following:

- Better customer service: By applying AI, banks can provide cost-effective, personalized, efficient services to customers. All banks are having chatbots 24 by 7 to answer customers' queries and counsel/guide them.
- Chabot's that are mostly used by all the respondent banks are powerfully assisting banks to tap the untapped population. Serving banks fetch more customers for borrowing and depositing, and they are ensuring business growth.
- The servicing costs of banks have been reduced drastically.
- AI helps in reducing cyber frauds by customer authentication.
- Approval and processing of loans has become quick due to application of AI.
- It assists banks to efficiently work on data and risk management
- To avoid rising NPA, to assess the creditworthiness of customers before sanctioning loans is the most important step. A customer's credit score can be identified by using AI and Big data.
- Through AI, financial literacy can be enhanced, which will ultimately result in financial inclusion.
- The main challenge banks are facing by use of AI is that there is lack of trust among customers. The algorithms discriminate against certain races and genders, which can cause ethical, legal, and regulatory problems. There is also a threat of privacy breaches and cyber security risks. (Kateryna Kraus & Shtepa, 2022)
- In India, fintech firms are playing the important role of facilitator in banking and finance.
- AI tools assist banks to enhance employee efficiency and in reducing employee errors.

Banks are using multiple AI tools for customer services, like catboats, payment transfers, loan appraisals,

credit scoring, fraud prevention, financial literacy, financial products, and services awareness.

Figure 2
Banking for Unbanked with AI Usage adapted from case companies analysis and Findings (T. Ravikumar, 2021)



Recommendations

After analyzing collected secondary data, the researchers have the following recommendations:

- Banks and financial services providers should tie up with fintech firms for technological innovations and reach out to the unbanked population. This will offer a combination of trust and technological innovation to Indian customers.
- While developing the algorithm in AI tools, care should be taken that there should not be any bias or discrimination against any gender or race. All should be considered equally. Thus, trust can be created among customers.
- There should be balance between financial regulations and flexibility.
- Banks in association with Fin Techs should focus on regulatory compliance and managing cyber risks. A cyber-risk prevention framework has to be implemented, and penetration tests should be carried out frequently.
- There should be specific plans for the banking sector in association with Fin Tech to prepare a framework of use for AI tools to achieve the highest financial inclusion.
- Age, income level and education impact financial inclusion. Thus, while implementing AI tools, financial literacy has to be focused.
- AI talent has to be enhanced by skill-enhancing education.

Scope for Future Research

In the present research study, the researchers have used secondary data. In the future research study, primary data can be collected, analyzed from the unbanked population to enhance application of AI tools in financial inclusion.

Conclusion

Thus, after digitalization over the globe, the banking sector is equipped with AI tools. In India, as a developing economy, for sustainable development, financial inclusion has immense importance. The

Reserve Bank of India, as a regulator, is making efforts to increase the scope of priority lending and sector lending, including start-ups (Rajas Saroy, 2020 Nov, 11) Security measures for digital payments have been given priority by RBI, such as requirements for additional factor authentication and online alerts for every transaction. It gives boosts to customer confidence and safety to go for digital payments. There is a big role for banks and fintech to bridge the digital gap between urban and rural customers to have equitable, broad-based customer participation by applying various AI tools. The government of India has established UPI and BHIM to make larger and easily accessible digital platforms to assist FI.

In an emerging economy like India's, demand and supply analysis of factors has to be carried out for the unbanked population. By taking specific efforts, the banking sector in association with fintech, India can achieve a high financial inclusion index in the coming days.

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