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Research Article

An Evaluation of Technology in Banking Process Systems for a Non-Performing Assets Perspective

[a]Awanish Kumar Sinha, [b]Pradeep Kumar Aggarwal
[a]*Assistant Professor, Sharda School of Business Studies, Sharda University, Greater Noida, Uttar Pradesh, India.*
[b]*Professor, Sharda School of Business Studies, Sharda University, Greater Noida, Uttar Pradesh, India.*
Email Id- [a]sinha_awanish@rediffmail.com, [b]drpka@gmail.com

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ABSTRACT

The role of technology in banking processes and systems, particularly concerning Non-Performing Assets (NPAs), is of paramount importance in today's digital era. Technological innovations, such as Artificial Intelligence (AI), blockchain, and advanced data analytics, have revolutionized traditional banking operations, offering unprecedented opportunities for NPA management. The reduction in NPAs of a bank can be attributed to various factors such as effective risk management, stringent lending policies, and asset quality improvement. Hence to overcome the challenges author focuses on the role of technology in the banking process to reduce the NPA ratio. It finds that AI-powered algorithms enable banks to automate credit risk assessment processes, identify potential NPAs at an early stage, and make informed decisions to prevent defaults. Additionally, blockchain technology provides a secure and transparent platform for managing loan contracts and collateral documentation, reducing the risk of fraud and enhancing the integrity of loan transactions. Furthermore, digital lending platforms and mobile banking solutions offer seamless and convenient experiences for customers, facilitating faster loan processing and improving loan servicing efficiency. The strategic integration of technology into banking processes and systems holds immense potential for reducing NPAs, enhancing asset quality, and fostering financial stability. Collaborative efforts between banks, regulators, and technology providers are essential to harnessing the full benefits of technology in NPA management and ensuring the resilience and growth of the banking sector in the digital age.

Keywords: Artificial Intelligence (AI), Bank, Blockchain, Customer, Non-Performing Assets (NPA).

1. INTRODUCTION

The exploitation of resources from nature and its role in environmental destruction are ongoing obstacles to economic advancement. Banks may make a major contribution to green banking technologies to reduce their carbon impact. Artificial intelligence and technology adoption may support realistic gains, cost-effective methods, market distinctiveness, and customer favorability, all of which can contribute to the sustainable success of business companies. Improving investments and funding is essential to building world-class infrastructure and streamlining corporate processes. Banks should give loans to eco-friendly companies with minimal carbon emissions priority. It is essential to embrace paperless transactions and commit significant funds to the promotion of environmentally friendly IP rights goods [1], [2]. The Government of India has implemented several regulatory and relief measures that have strengthened the banking industry's resistance against Non-Performing Assets (NPAs) and sped up the recovery process. Banks in particular continue to be very concerned about NPAs. Banks need to adopt new technologies in fields like artificial intelligence, blockchain, and cloud computing to stay up with changing trends. It is essential to use technology to align lending operations with green standards. This endeavor aims to improve lending practices' operational efficiency by influencing borrowers' business activities. "Green banking" refers to a wide range of policies and procedures meant to guarantee sustainability in terms of the economy, society, and environment [3], [4].

Technology is a key component in transforming and modernizing banking procedures in the financial services industry. Technology and banking have a symbiotic connection that has swiftly changed, bringing in an age of digitalization, efficiency, and improved consumer experiences. Numerous technical developments, including blockchain, digitalization, artificial intelligence, and machine learning, have fueled this shift. In this talk, we explore the complex role that technology plays in banking operations and look at how it affects customer service, risk management, operational effectiveness, and the state of financial inclusion as a whole. Technology has significantly changed how financial organizations operate by improving efficiency and simplifying procedures [5], [6]. Automation has become an essential tool for banks, allowing them to automate repetitive processes including account administration, transaction processing, and regulatory compliance. This lowers the margin for mistakes and lowers operating expenses, resulting in a more dependable and safe banking environment. Furthermore, innovations in banking procedures such as robotic process automation (RPA) have improved overall agility, sped up transaction times, and optimized back-office operations.

Furthermore, risk management procedures in the banking industry have been completely transformed by the fusion of artificial intelligence (AI) and data analytics. Large volumes of data are analyzed in real-time by sophisticated analytics algorithms, which help banks identify and proactively manage any hazards. The security of digital transactions may be strengthened by machine learning algorithms, which can recognize patterns of fraudulent activity. Predictive analytics models also make credit scoring and evaluation easier, which enables banks to make better loan choices while lowering default risks. For this reason, technology strengthens risk management systems and makes banks more resilient to erratic market circumstances [7], [8].

The banking industry's customer service environment has been completely transformed by technology, along with operational efficiency and risk management. Customers now have easy access to financial services because of digitalization, which has removed time and location limitations. A myriad of activities, from financial transfers and bill payments to investment management, are available at the touch of a screen via mobile banking apps and internet platforms. Furthermore, the advent of chatbots and virtual assistants has completely changed how businesses connect with their customers by offering 24/7 customized help and query resolution. The transition to digital banking has not only made banking more convenient for consumers, but it has also raised their standards for timeliness and quality of service [9], [10].

Beyond improvements in customer service and operations, technology is essential for promoting financial inclusion and closing the digital gap. Participation in the formal financial system has become possible for underprivileged communities due to the spread of digital payment options and mobile banking. Mobile money systems have become indispensable in areas where conventional banking infrastructure is scarce, enabling safe and easy transactions. Furthermore, blockchain technology has the potential to transform international remittances and lower transaction costs, promoting financial inclusion globally. Banks may access previously unbanked or under-banked portions of society by using technology, which promotes social development and economic empowerment [11], [12].

But even with all of the advantages that technology offers, banks continue to face new risks and concerns. The digitization of banking procedures exposes institutions to a wide range of cyber risks and data breaches, making cybersecurity an urgent issue. Hackers take advantage of holes in banking systems to commit fraud, steal confidential data, and interfere with essential services. This puts financial stability and consumer confidence at danger. As a result, to strengthen their defenses against constantly changing cyber threats, banks need to invest in strong cybersecurity measures, such as encryption protocols, and multi-factor authentication, along with continuous monitoring systems. Furthermore, banking professionals must continuously adapt and up skills due to the fast rate of technological innovation. The use of cutting-edge technology by banks, such as artificial intelligence, blockchain, and big data analytics, has created a critical need for certain skill sets and knowledge. Thus, it becomes essential to engage in employee training programs and promote an innovative culture to provide banking staff with the necessary skills and expertise. Banks can unleash the full potential of digitalization to achieve sustainable development and competitive advantage by developing a staff skilled at exploiting technology [13], [14].

The present research is about the role of technology in the banking process from an NPA perspective. The remaining paper structured in section 1 provides background on the banking process and technology used such as AI, blockchain, and big data analysis. Section 2 provides the literature review in the context of an analysis of automated procedure automation's effects on consumer satisfaction in the retail banking sector. Section 3 presented the

methodology based on the questionnaire survey. The result discussion and conclusion are presented in sections 4 and 5 with the future scope of the research.

2. LITERATURE REVIEW

H. Elmustapha *et al.* [15] examined different stakeholders' viewpoints, roles, and effects on the uptake of solar energy technologies in Lebanon. The impact of stakeholders, including end users, public lawmakers, the banking industry, suppliers, consultants, and non-governmental organizations, was assessed by qualitative data analysis, which included semi-structured interviews. Our research strategy, which focuses on socio-cultural elements of clean technology adoption, integrates critical and grounded theoretical frameworks inside a case study design, enabling a semi-inductive process to provide new insights and supplement current material. The results underscore the noteworthy influence of contextual variables, including social, cultural, geographical, and market aspects, on market growth, specifically concerning the adoption of solar energy technology across various consumer categories. More academic attention be paid to the impact of stakeholder viewpoints and socio-cultural variables on the adoption of renewable energy technologies in light of these results.

S. Mehra [16] investigated how applying quality management concepts to the efficient evaluation of core organizational resources like technology and human resources affects the performance of service firms. It has been shown that the smooth operation of these organizational resources affects the development and application of quality management plans, hence improving the performance of the whole company. The research evaluates the importance of technology and people-based assets with a focus on retail banking companies, using empirical data. Multiple banking managers participated in in-depth interviews that served as a real-world validation of the outcomes. The study emphasizes how crucial essential resources are to the banking industry's ability to successfully use quality management concepts. To enhance corporate performance, it also covers how managers should give priority to the creation and use of these assets while creating quality management procedures. Despite focusing on the banking industry, this study's extremely small sample size may restrict how broadly applicable its conclusions are to other industries. Furthermore, the fluid character of financial legislation was not well taken into account. However, the thorough managerial input that was received provides insightful information for putting the study's findings into practice and lays the groundwork for future investigations that can look at sustainability and corporate responsibility concerns concerning quality management techniques.

I. P. Andrushkiv and L. M. Nadiyevets [17] discussed Estonia's experience creating an information society and methodically looked at the elements that have recently fueled active digitization in Ukraine's banking sector. The work also describes the function of digital banks and how they came to be in the international financial system, paying particular attention to the First Ukrainian International Bank's electronic banking capabilities and detailing the unique characteristics of this brand-new digital banking model. It also emphasizes the advantages of using cloud technology in the banking sector. It examines patterns in domestic banks' use of Internet banking services as of January 1, 2018. It presents the case that to ensure effective development, significant changes in the banking industry during digitalization should give priority to customer-centric approaches. Examples of these changes include improving customer service quality, developing new products and improving old ones, growing and optimizing channels for the delivery of banking services, encouraging digitally oriented employee training, and putting optimization of processes measures in place.

A. B. Vysotskaya [18] addressed the complex interrelationship between accounting informational systems (AIS) and matrix modeling, highlighting the latter's critical function in guaranteeing accurate & transparent reporting of economic operations. The author gives a new concept of accounting information systems in the backdrop of contemporary economic growth and demonstrates how such systems make it easier to represent functional knowledge pieces inside information modeling systems. The paper explores how a knowledge-based economy is conceptualized and clarifies the role of accounting in this context. It indicates that information systems that can provide thorough data reporting on corporate operations play a major role in the dependability of accounting systems. This important area of accounting has seen a profound transformation with the introduction of information technology, making contemporary accounting increasingly dynamic and significant in influencing economic decision-making. As a result, new standards for accountants' professional education and training are required as our knowledge of accounting science and its influence on accounting procedures advances. The turnaround time for data entry has notably decreased, especially when processing invoices and banking data. The need for a thorough reassessment of traditional accounting methods led to a paradigm shift in several accounting-related areas.

M. Abramova [19] investigated the entities, individuals, and transactional patterns related to cryptocurrency as a unique economic entity inside the socioeconomic framework the aim of this analysis. The main goal is to assess how cryptocurrency will function in the developing digital economy, both in terms of present use and future possibilities. The goals include examining the function and importance of cryptocurrency in modern economies and how monetary exchange systems have changed in response to the increased use of information networks and technological breakthroughs. The strengths, weaknesses, possibilities, and risks of using cryptocurrency in monetary systems, the payment business, and banking sectors are all examined in this SWOT analysis. The result outlines the advantages and disadvantages of cryptocurrency assets as well as the technology that enables their production and transfer. Moreover, it investigates the possible uses of cryptocurrency in national economies' macro- and microeconomic processes.

M. S. Chvanova *et al.* [20] analyzed how the Internet affects society and how important it is to the modernization of public education is the goal. This entails evaluating how the Internet satisfies and modifies users' needs in a variety of ways, including leveraging and creating novel educational tools online, encouraging project competencies by way of communication, and investigating the possibilities of cutting-edge online socialization strategies. Using novel kinds of online socializing, the research also investigates interactions with outside partners and their effects on learning processes. These include electronic scientific video conferences, social networking, cloud resources, online communities, chat rooms, electronic libraries, e-government, online banking, and leisure services. Further, the study explores the pedagogical effects of Internet elements on youth socialization.

The above study emphasizes how important it is for financial organizations to have access to the necessary resources for them to successfully use quality management standards. It also emphasizes how crucial it is for managers to give the development and use of these resources priority while creating quality management protocols to boost organizational performance. The study's results may not be as broadly applicable as they may be due to restrictions including a limited sample size and inadequate consideration of changing financial rules, even if the emphasis is on the banking sector. However, the thorough feedback provided by managers provides insightful advice for real-world application and lays the groundwork for future studies that combine quality management methods with issues of sustainability and corporate responsibility. In this research, the author's questionaries survey the role of technology in the banking process and system from an NPA perspective.

3. METHODOLOGY

3.1. Research Design:

The primary data of this research is collected from the internet, publications, magazines, and news articles. In-depth interviews with banking professionals, including executives and technology experts. Exploration of relevant documents such as annual reports, policy documents, and industry publications.

3.2. Sample:

Gross NPAs are advances or loans for which the borrower has stopped repaying the principal amount owed after a certain amount of time. These NPAs seriously jeopardize the stability and health of banks and other financial institutions. The total amount of NPAs reflects loan repayment failures and possible losses, and it shows the bank's exposure to credit risk. Excessive NPA levels may strain a bank's capital reserves, reduce its profitability, and hinder its capacity to provide new loans. Elevated NPAs may also cause regulatory attention and erode investor trust, requiring remedial action to enhance asset quality. To manage and lower NPAs, banks use a variety of tactics, such as asset recovery, loan restructuring, and strict risk assessment procedures. Table 1 depicts the gross NPA ratio of the worst five banks.

Table 1: Illustrates the gross NPA ratio of the worst five banks [21].

S.NO.	Worst Five	Net NPA (%)
1	Union Bank of India	7.5
2	Punjab National Bank	8.6
3	Punjab & Sind Bank	9.8
4	Lakshmi Vilas Bank	7.5
5	Central Bank of India	6.5

The percentage of non-performing assets to total loans is represented by the gross NPA ratio, which is an important indicator of the health and stability of banks. The gross NPA ratios of the top five banks in the world vary significantly, indicating different risk profiles and asset quality management strategies. Thanks to strict lending guidelines and strong risk management systems, one of the top banks, Bank of America, continuously keeps its gross non-performing asset ratio lower than that of its competitors. Comparatively speaking, JPMorgan Chase, another well-known international bank, has an excellent history of managing asset quality, as shown by its relatively low gross non-performing asset ratio. Table 2 depicts the gross NPA ratio of the best five banks.

Table 2: Illustrates the gross NPA ratio of the best five banks [21]**.**

S.NO.	Best Five	Net NPA (%)
1	HDFC Bank	0.4
2	DCB Bank	0.6
3	Kotak Mahindra Bank	0.8
4	Bandhan Bank	1.4
5	IndusInd Bank	1.5

3.3. Instrument:

The secondary data of this research is based on analyzing the impact of technology adoption on banking efficiency and NPA management. It explores the use of data analytics, artificial intelligence, and blockchain technology in addressing NPAs. Examining the relationship between technological advancements and changes in banking regulations regarding NPAs. The tools used to obtain the relevant data such as Python, statistical analysis software, excel, and SPSS.

i. How essential do consumers consider technology in managing Non-Performing Assets (NPAs) within your banking institution?
ii. Do consumers believe technology has helped improve the efficiency of NPA identification and resolution?
iii. Which specific technological tools or systems do customers find most effective in addressing NPAs?
iv. Have consumers observed a decrease in NPA levels since the implementation of technological solutions in your bank?
v. How would customers rate the effectiveness of technology in reducing NPA-related risks within your organization?
vi. How satisfied are consumers with the current level of technological support available for NPA management in your bank?
vii. Do customers believe technology can play a significant role in preventing the occurrence of NPAs in the banking sector?
viii. How confident are consumers in your bank's ability to utilize technology effectively to address NPAs?
ix. How confident are people in your bank's ability to leverage emerging technologies (e.g., blockchain, artificial intelligence) to effectively address NPAs and mitigate associated risks?
x. How can the integration of e-banking technologies, risk management software, and credit monitoring in lending collectively contribute significantly to minimizing bank NPAs?

3.4. Data Collection:

An in-depth understanding of how technology functions in banking systems and procedures from an NPA viewpoint may be formed by combining information from various secondary data sources. This understanding will help in the development of research, policy, and strategic decision-making within the banking industry. Table 3 depicts the survey question on technology in the banking process from the NPA perspective.

Table 3: Illustrates the survey question on technology in the banking process with an NPA perspective.

S.NO.	Question	Yes Responses (percentage)	No Responses (percentage)	Neutral Responses (percentage)
1	How essential do consumers consider technology in managing Non-Performing Assets (NPAs) within your banking institution?	35	40	25
2	Do consumers believe technology has helped improve the efficiency of NPA identification and resolution?	30	60	10
3	Which specific technological tools or systems do customers find most effective in addressing NPAs?	23	66	11
4	Have consumers observed a decrease in NPA levels since the implementation of technological solutions in your bank?	28	49	13
5	How would customers rate the effectiveness of technology in reducing NPA-related risks within your organization?	27	52	21
6	How satisfied are consumers with the current level of technological support available for NPA management in your bank?	55	30	15
7	Do customers believe technology can play a significant role in preventing the occurrence of NPAs in the banking sector?	30	33	37
8	How confident are consumers in your bank's ability to utilize technology effectively to address NPAs?	26	40	34
9	How confident are you in your bank's ability to leverage emerging technologies (e.g., blockchain, artificial intelligence) to effectively address NPAs and mitigate associated risks?	40	29	31
10	How can the integration of e-banking technologies, risk management software, and credit monitoring in lending collectively contribute significantly to minimizing bank NPAs?	53	25	22

3.5. Data Analysis:

To efficiently handle NPAs and reduce associated risks in the banking industry, bankers need to proactively use cutting-edge technology like blockchain and AI. Predictive modeling and risk assessment are made possible by AI's sophisticated analytical capabilities, which have the potential to completely transform NPA management. AI systems can detect early warning signs of possible NPAs by evaluating large datasets. This capability enables banks to take proactive steps to reduce losses and limit risks. AI-driven chatbots and virtual assistants may also improve customer interaction and expedite lines of communication, enabling prompt resolution of NPA-related questions and

problems. Figure 1 depicts how bankers should leverage emerging technology like AI, and blockchain to effectively address NPAs and mitigate related risks.

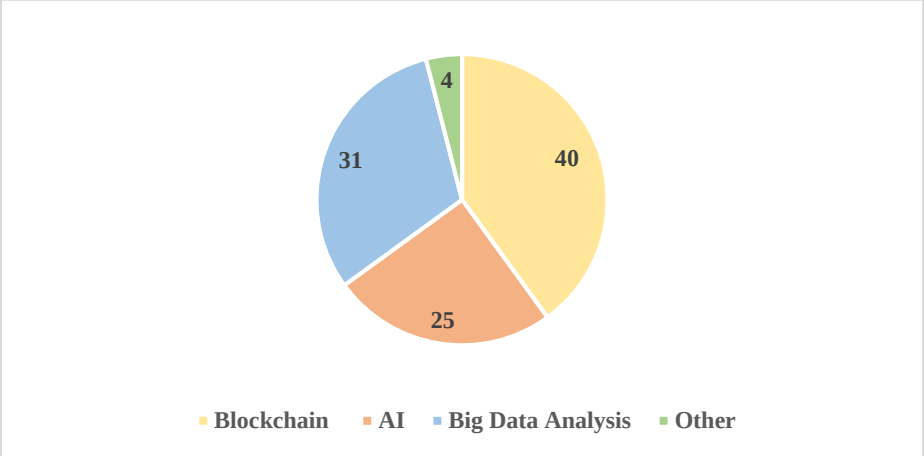


Figure 1: Illustrates bankers should leverage emerging technology like AI, and blockchain to effectively address NPAs and mitigate related risks.

4. RESULTS AND DISCUSSION

Bank NPAs may be considerably decreased by lending institutions integrating e-banking technology, risk management software, and credit monitoring. E-banking technologies improve client comfort and expedite banking procedures. These technologies include electronic payment systems, mobile banking apps, and internet banking platforms. E-banking lowers the risk of payment defaults and increases overall loan servicing efficiency by giving users simple access to financial information, transaction history, and payment choices. Additionally, banks may proactively detect, evaluate, and reduce possible risks related to lending operations by using risk management software. These software programs assess creditworthiness, track borrower behavior, and identify early warning indicators of financial hardship by using complex algorithms and data analytics. Banks may reduce the likelihood of loan defaults and ensuing NPAs by making educated lending choices by integrating real-time risk assessments into their decision-making procedures. Lending institutions' credit monitoring also significantly contributes to the decrease of NPAs by providing careful oversight of borrowers' financial stability during the loan. Lenders can monitor repayment trends, keep tabs on changes in borrowers' credit profiles, and quickly discover new concerns via routine credit assessments. Lenders may avert prospective defaults and limit the creation of NPAs by implementing proactive measures, such as loan restructuring or borrower support programs, as soon as they identify a decline in creditworthiness. Figure 2 depicts the integration of e-banking technologies, risk management software, and credit monitoring in lending collectively contribute significantly to minimizing bank NPAs.

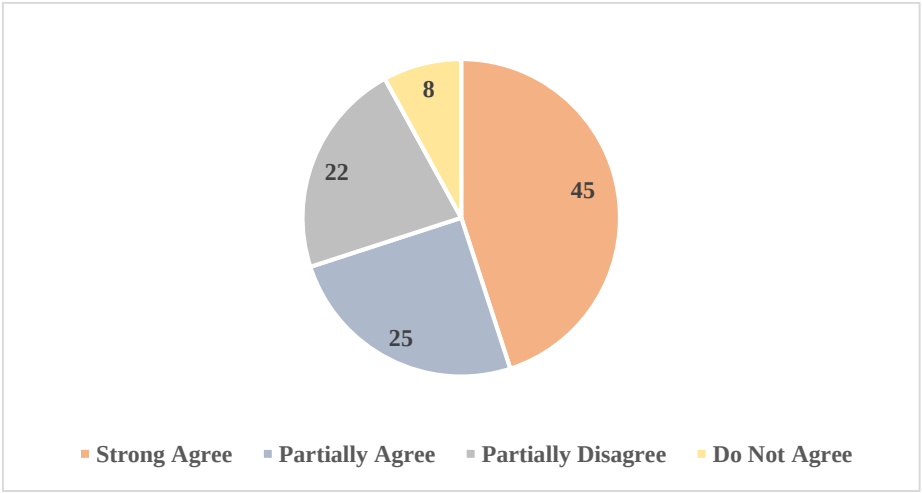
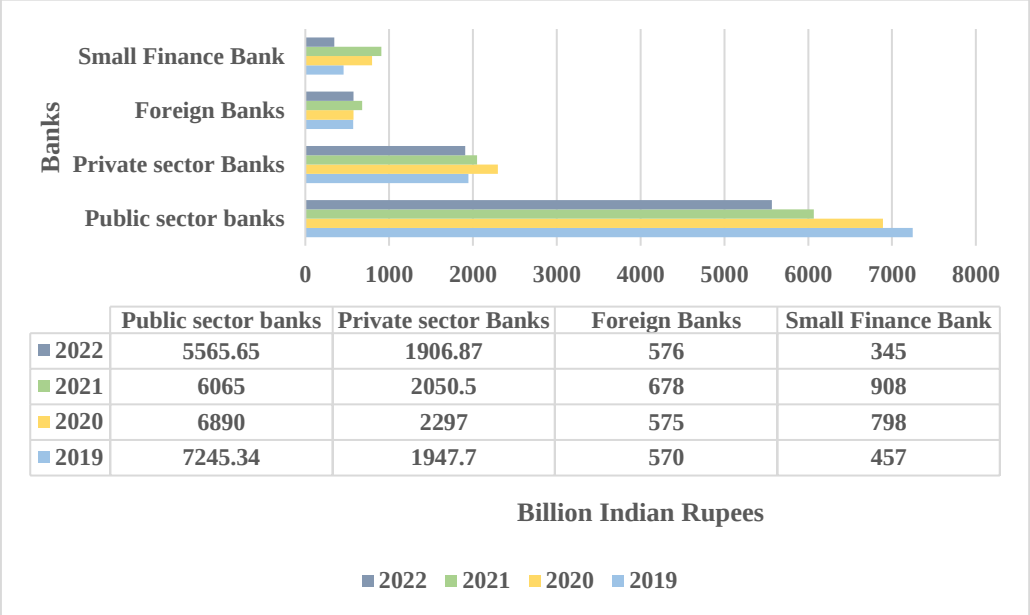


Figure 2: Illustrates the integration of e-banking technologies, risk management software, and credit monitoring in lending collectively contribute significantly to minimizing bank NPAs.

According to the most recent data available, the banking industry in India has serious concerns about the gross NPAs of scheduled commercial banks. NPAs are loans and advances that, as a result of borrowers' non-payment, no longer bring in money for banks. India has seen a sharp rise in NPAs in recent years, which has been mostly ascribed to economic downturns, problems with corporate governance, and difficulties in the infrastructure and agricultural sectors. To resolve the NPA issue, the Reserve Bank of India (RBI) has been aggressively putting resolution frameworks and asset quality assessments into place. The profitability and financial stability of India's scheduled commercial banks have been negatively impacted by the persistently high gross NPAs of these banks. To lessen the negative impacts on the banking industry and promote sustainable economic development, banks must keep improving their credit assessment processes, bolstering their risk management procedures, and taking aggressive steps to resolve NPAs. Figure 3 depicts the gross NPA assets of scheduled commercial banks in India.



	Public sector banks	Private sector Banks	Foreign Banks	Small Finance Bank
2022	5565.65	1906.87	576	345
2021	6065	2050.5	678	908
2020	6890	2297	575	798
2019	7245.34	1947.7	570	457

Figure 3: Illustrates the gross NPA assets of scheduled commercial banks in India [22].

3.6. Banks need to adopt the following new e-technology to reduce the NPA ratio:

a) Advanced-Data Analytics:

Banks may examine vast amounts of customer data to find patterns and trends linked to possible defaulters by putting powerful data analytics technologies into use. More precise credit risk forecasting is possible with predictive analytics, allowing for proactive NPA prevention.

b) Artificial Intelligence (AI) and Machine Learning (ML):

Banks may benefit from AI and ML algorithms by using them to automate credit risk assessment procedures, improve the precision of credit scoring models, and identify early warning signs of impending NPAs. By giving borrowers individualized support and timely alerts, AI-driven chatbots may also enhance customer service.

c) Blockchain Technology:

It is possible to reduce the risk of fraud and guarantee the integrity of loan contracts by using blockchain technology for safe and transparent loan origination and certification procedures. By automating loan agreements, smart contracts on blockchain-based systems may streamline the loan distribution and repayment process and save operating expenses.

d) Digital Lending Platforms:

Banks may provide easy online loan application and approval procedures by using digital lending platforms. By using digital documents and e-signatures, these systems improve client ease while cutting down on paperwork and processing times. Early warning indicators of the financial crisis may also be found by tracking borrower conduct in real time on digital platforms.

e) Robotic Process Automation (RPA):

RPA may reduce errors and increase operational efficiency by automating repetitive, rule-based operations including document verification, data input, and loan processing. Banks should focus their resources on proactive NPA management measures by releasing human resources from routine activities.

5. CONCLUSION

Technology plays a critical role in banking systems and operations, especially when it comes to NPAs. Technology has completely changed the way banks function, providing creative ways to deal with the problems brought on by NPAs and enhancing overall asset quality. Banks may improve their capacity to recognize, evaluate, and reduce credit risks by using cutting-edge technology like blockchain, AI and sophisticated data analytics. Banks may use algorithms based on machine learning and AI to automate credit risk assessment procedures, spot probable NPA early warning signs, and make data-driven default prevention choices. Additionally, by offering a transparent and safe platform for handling collateral documents and loan contracts, blockchain technology lowers the possibility of fraud and disputes. Digital lending platforms facilitate the origination of loans more efficiently, while mobile banking solutions provide easy access to loan servicing resources, which lowers the number of delinquencies. But it's crucial to understand that technology by itself cannot solve the problem of managing non-performing assets. To reduce the risks connected to the use of technology, banks need to make investments in strong risk management frameworks, personnel training, and cybersecurity measures. To create an atmosphere that is favorable to ethical and long-lasting technical innovation in banking, cooperation between banks, regulators, and technology suppliers is essential. Banks may better manage the complexity of non-performing assets (NPAs) and support the resilience and expansion of the banking industry in the digital era by using innovative technology and good risk management procedures.

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