Role of technology in reduction of non-performing assets (NPAs) in Indian banking sector (with special focus on global trends).

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Abstract

Indian banking sector has been facing serious problems of rising Non-Performing Assets (NPAs) in recent times. NPAs beyond a certain level are a cause for concern for everyone involved because credit is essential for economic growth and NPAs affect the smooth flow of credit. When a loan becomes non-performing, it directly affects the profitability, since higher NPAs require higher provisioning, which means a large part of the profits need to be kept aside as provision against bad loans. AI (Artificial Intelligence) technologies on the other hand, have matured now and are ready to be simple-mented. They offer an exciting opportunity to establish new operational models and based on insights from Data analytics, it can provide scope to identify gaps in current financial sector offerings; uncovering opportunities and advantages that can be seamlessly helpful to address the problem of rising NPAs in Indian Banking Sector.

Keywords: Artificial intelligence, Big data analytics, Machine learning, Non-performing assets, Natural language processing.

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Introduction

Across the globe, the banking sector acts as an enabler for any country's economic and social development. Banks collect funds together from customers and make them available for investments via issuing loans, thereby providing liquidity and allowing smooth flow of savings and investments. In emerging economies, banks are more than mere enablers of financial intermediation and support the additional responsibility of making up for the nation's social agenda. There is a close relationship between banking and economic development where the growth of the overall economy is intrinsically correlated to the health of the banking and financial industry.

Artificial Intelligence (AI) is a recent technology enabler which refers to the human brain simulation by machines to carry out functions like logical reasoning, learning, self-correction, robotics etc. Big Data Analytics refers to the extraction of relevant insights from data using various techniques from fields like machine learning, computer programming, statistical modelling, pattern recognition, data warehousing, cloud computing etc. to discover hidden patterns, unknown correlations, current market trends, basic customer preferences and other useful information that can help organizations make more-informed and profitable business decisions. AI has been around since 1956 and it has continued to be a topic of experimentation for corporate, but it never really found its way into real world applications. However, the recent developments and maturity of certain underlying technologies meant that AI powered applications have now become commercially viable [1].

The key challenge going forward for Indian banks is to expand credit portfolio and effectively manage NPAs while maintaining profitability. Asset quality continues to be the basic function and also the biggest challenge for banks in the present dynamic environment. In order to overcome the perceived risks, there is an urgent need for banks to have well-structured and effective credit appraisal and monitoring system in place coupled with appropriate business models which can be powered by Artificial Intelligence technologies to effectively manage all the current issues revolving around recovery in stressed assets and thereby help in reduction of NPAs across all banks.

Literature Review

A large number of researchers have studied the issue of NPA in banking industry but only a few studies have shown how Artificial Intelligence (AI) can be used in banking sector. A review of the relevant literature has been described [2].

A bank's reported earnings and capital depends on how they account for its bad loans (NPAs). Studies were made on US banks which share a lot of similarities with banks across the globe when it comes to measuring loan loss reserve ratio.

NPA reduction is possible with strengthening legal system and increasing transparency among institutions. Three institutional variables of Corruption, Degree of political intervention and rule of law also impact credit outcomes. Conclusion was drawn that NPAs are mainly driven by bank-specific factors.

The NPA level of 22 public sector banks and 15 private sector banks. The study found that both macro-economic and bank-level factors are responsible for rise in NPAs. Even though NPA level in India had decreased from maximum to minimum, the gradual increase of NPA during last few years has caused concerns for everyone. The study suggested that banks must have prudent credit policies to restrict bad effects of credit risk [3].

The effect of changing business cycles on performance of banks in emerging economies from the period. They concluded that the two main factors influencing loan performance are economic growth, followed by interest rates. Higher loan defaults are attributed to poor loan asset quality, supervision, limited area penetration and low capital of banks.

NPA is the main cause of the global financial crisis that we saw recently. NPA issue has been given attention after the liberalisation of financial sector in India. NPA in the priority sector advances is higher than that of the non-priority sector. The SSI (Small Scale Industries) is worst performing under Priority Sector advances. The study suggested use of Self-Help Group model to some of the sectors to help the borrower's access loans and ensure loan repayment to the banks .

NPAs of different nationalised banks concluded that level of Gross NPA and Net NPA is having upward trend in all the nationalised banks but the growth rate is different which shows their relative efficiency in NPA management. Wilful defaults, improper due diligence and processing of loans, lack of proper monitoring are the causes for accounts for becoming bad assets.

Opined that only a few private sector banks in India are using AI (Artificial Intelligence) technologies and its usage is also very limited to some common operations related work.

Suggested that reduction in Non-performing loans has a positive effect on growth of GDP and growth opportunities in investment. It also depicted that economy is affected more positively in case of NPA reduction. Countries which experience inflow of fresh credit grow in the fastest pace, andtheir economies actively seek to resolve NPAs.

The applications of AI (Artificial Intelligence) in top 4 Indian banks and concluded that data analytics and customer service create the opportunity for customized, personalized and faster customer experiences, significantly resulting in better insights, and automation/synchronization of back-end workflow systems [4].

Global Trends of Using AI and Big Data Analytics

The biggest learning from global trends is to understand how various financial-tech firms across the world are using AI technologies and Big Data to contribute towards NPA reduction.

Zest finance

A fast growing American fintech firm, leverages big data technology in credit and loan underwriting. With the help of machine learning, its proprietary platform, processes massive volumes of data which was earlier ignored by credit underwriters to identify under-banked creditworthy prospects as well as mitigate the risk in credit decisions.

Zest Finance's value business proposition is to help isolated borrowers, like new generation youth customers, who had no access to credit earlier, to now be able to avail loans. This strategy has paid off by bringing the default rate down to 15%.

Australian Securities and Investments Commission (ASIC)

It is using NLP (Natural Language Processing) and other AI technologies to visualise and explore the extracted data and their relationships in order to fight criminal and unscrupulous activities carried out through the banking system (such as money laundering). It collects detailed information on bank transfers and correlates this information with information from newspaper articles. The correlation involves both structured and unstructured data with even file sizes of more than 25-50 gigabytes.

Monetary Authority of Singapore (MAS)

It is exploring the use of AI and machine learning in the analysis of suspicious transactions to identify those transactions that require further attention, allowing supervisors to focus their resources on higher risk transactions (Figure 1).

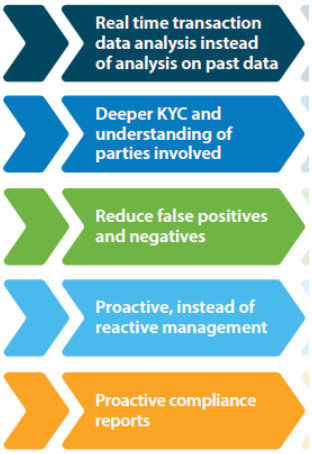

Figure 1. *Risk management using AI (Artificial Intelligence).*

Investigating suspicious transactions is time consuming. Machine learning is being used to identify complex patterns and highlight the suspicious transactions that are potentially more serious and require more investigation. With complex machine learning methods to analyse the granular data from transactions, client profiles, and a variety of unstructured data, machine learning is being explored to discover non-linear relationships among different attributes and entities, to detect potentially complicated behaviour patterns of money [5].

Laundering and the financing of terrorism not directly observable through suspicious transactions filings from individual entities. Market regulators can also use these techniques for disclosure and risk assessment (Figure 2).

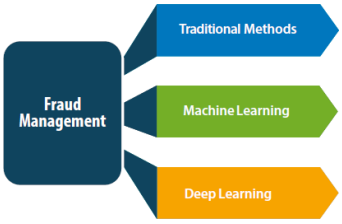

Figure 2. *Fraud management using AI (Artificial Intelligence).*

US Securities and Exchange Commission (SEC)

The staff leverages "big data" to develop text analytics and machine learning algorithms to detect possible fraud and misconduct. Certain risk assessment tools are beginning to move into the AI space. For instance, the SEC staff uses machine learning to identify patterns in the draft of SEC filings. With supervised learning, these patterns can be compared to past examination outcomes to find risks in investment manager filings. The SEC staffs finds that these techniques are five times better than available random techniques.

Significance of Study

Most of the research and studies are being done on causes, impact and management aspects of NPAs but there is a huge time gap existing for the comprehensive research on quality aspects of NPAs, practical issues being faced by bankers on daily basis and how latest technologies like AI and Big Data Analytics be used to resolve the issue of surmounting NPAs.

This study therefore, seeks to fill this gap by establishing the link between NPAs and how AI technologies along with Big Data Analytics resolve the issue of NPA Management [6].

Research objective

Keeping the above Literature review in mind, the objectives of the Research are given below.

- To study the factors resulting in rise of NPAs in Indian Banking Sector.
- To suggest remedial mechanisms /strategies of how Artificial Intelligence (AI) technologies and Big Data Analytics can help in faster resolution of Non-Performing Assets.
- To study the applicability of Artificial Intelligence and Big Data Analytics in select economies of the World.

Data collection

Primary data

It is collected through structured personal interviews and observation method with bankers at all management levels along with research scholars/corporate/Govt.Officers (Table 1).

Table 1. *Strategy of interviews and observational methods.*

Sr.No.	Description	Total
1	Loan Recommending Officer	35
2	Loan Sanctioning Officer	28
3	Credit dept. in-charge	18
4	Regional/Zonal Head/Top Management Exec.	3
5	Others	
	1) Corporate	23
	2) Research Scholars	9
	3) Govt. Officers	5
TOTAL	121	

Since the population size is very big it was not feasible to study the entire population, so the researcher identified around 100 bankers, 30 corporate, 10 research scholars and 10 Govt [7]. officers for the study (150 in total), out of which total following respondents were used to obtain normality of data.

Data interpretation

The major issue of rise in NPA of banks is because of improper due diligence done by loan recommending/sanctioning officers leading to accounts turning bad.

Also, at times, lenient credit terms help the borrowers to divert funds, thereby increasing the chance of accounts turning into NPA. The study showed the major External Factors leading to rise in NPAs as shown in (Figure 3).

Bank specific factors affecting NPAs

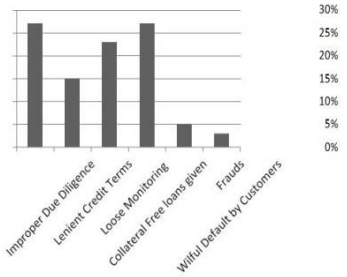

Figure 3. *Bank-specific factors affecting NPAs.*

- Improper Due Diligence
- Lenient Credit terms
- Loose Credit Monitoring
- Collateral free loans given
- Frauds
- Wilful default by customers

If we see the Current Sector-wise Lending Preference, maximum preference is now given to Retail loans like Housing, mortgage-based loans to MSME borrowers and Agriculture loans, as shown in (Figures 4 and 5).

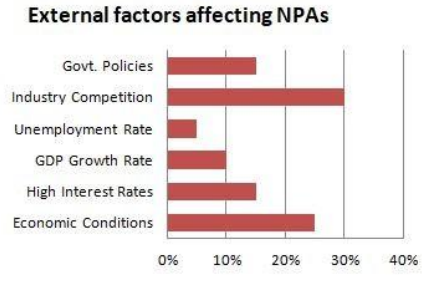

Figure 4. *External factors affecting NPAs.*

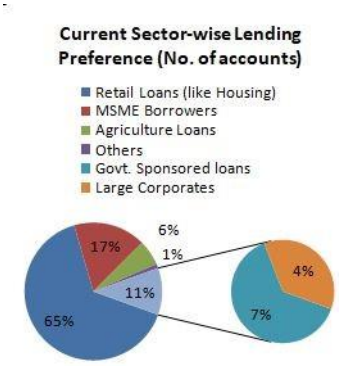

Figure 5. *Lending preference based on current Risk pattern for NPA conversion.*

Role of artificial intelligence in npa reduction

We will now see how existing technologies of AI and Big Data Analytics can resolve the NPA problem (Figure 6).

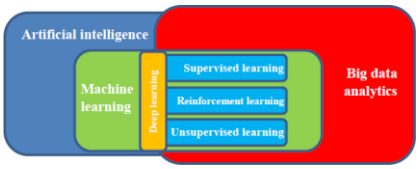

Figure 6. *Schematic view of AI, machine learning and data analytics.*

Credit scoring

As can be seen in Figure 6, Credit scoring tools use the concept of "machine learning" which is designed to speed up lending decisions, while taking care of perceived risks associated with each credit decision. As many credit agencies are present like CRISIL, CARE, ICRA etc., the AI powered technologies will help in Data Integration, which will further help the bankers to rely on credit scores to make lending decisions for individuals and firms. Data on transactions and payment history from financial institutions serve as the foundation of most credit scoring models. These models use tools such as regression, top-down decision trees, and statistical analysis to generate credit scores using limited amounts of structured data [8].

Banks and other lenders are also increasingly turning to additional, unstructured and semi-structured data sources, including social media activity, mobile phone use and text message activity, to capture a more detailed view of creditworthiness, and improve the rating accuracy of loans. Applying machine learning algorithms to the abundance of new data has enabled assessment of qualitative factors such as consumption behaviour, willingness to pay, payment history terms etc. The ability to leverage additional data on such measures allows for greater, faster, and cheaper segmentation of borrower quality and ultimately leads to a quicker credit decision, thereby not only enhancing the credit quality but also help in speedy disposal of applications received.

Chatbots–reminders for faster recovery of loan installment/ overdues

Chatbots are virtual assistants that can help customers to transact, solve their problems instantly and remind them about their repayment due dates from time to time. These automated programmes use NLP (Natural Language Processing) to interact with clients in natural language (by text or voice), and use machine learning algorithms to improve over time.

Chatbots are being introduced by a range of financial services firms, often in their mobile apps or social media (Figure 7).

Figure 7. *Interactive chatbots.*

Data quality assurance and kyc-aml monitoring

AI and machine learning methods help to improve surveillance by automating data quality assurance.

A series of new reporting requirements across jurisdictions has led to a greater transparency, volume and frequency of reported data, as well as greater resources required from financial institutions to complete reporting on time [9].

Monitoring of liquidty stress and volatility

Machine learning can be applied to systemic risk identification. Assessment and propagation channels.

Specifically, NLP tools may help authorities to detect measure, predict, and anticipate, among other things, market volatility, liquidity risks, financial stress, housing prices, and unemployment.

Till now, the most speedy measure of Recovery is OTS (One time settlement) done by the Borrower with the Bank but that results in a huge sacrifice done by banks, that directly affects their profitability [10].

However, SARFAESI Actions (13(2) and 13(4) notices) have proven to be effective recently but not as per what the current situation demands.

Based on Primary Data research conducted, the most-speedy remedial measures for NPA Management as per respondents, are shown in (Figure 8).

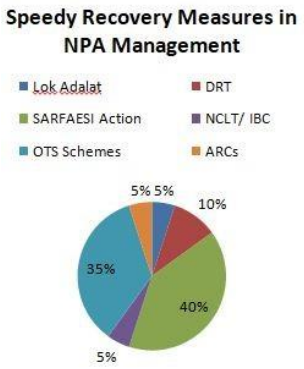

Figure 8. *Effective remedial measures for NPA management*.

However, this gap can be filled by Artificial Intelligence. When AI technologies will integrate with various Recovery Agencies in India like Debt Recovery Tribunals, LokAdalats, NCLT etc. (as shown in Figure 8) , the process of recovery of bad loans will be much faster leading to transparency of data and speedy execution of court matters [11].

AI and machine learning can be used for risk management through earlier and more accurate estimation of risks. For example, to the extent that AI and machine learning enable decision-making based on past correlations among prices of various assets, financial institutions could better manage these risks. Tools that mitigate unavoidable risks could be especially beneficial for the overall system [12]. Also, AI and machine learning could be used for anticipating and detecting fraud, suspicious transactions, default, and the risk of cyber-attacks, which could result in better risk management.

Conclusion

The study concludes that Artificial Intelligence and Big Data Analytics have a significant impact on NPA Reduction in Banking as they are able to address almost all the factors responsible for rise in NPA in banking sector.

While the concept of Artificial Intelligence has been around for decades, it is only recently that the AI fantasy has started to turn into reality. Many of the technology pieces are already in place, in varying stages of maturity. Many banks have made a start by incorporating several AI components into their processes and have experienced early results. As we have seen in this paper, most of the issues of handling NPA Management can be handled using AI and Big Data Analytics, which will help in strengthening balance sheets of banks and further enhance credit quality. In global context, many banks have already started using AI and Data Analytics for Risk management and Fraud detection, which has not only reduced the level of rising NPAs but also improved identification of creditworthy customers to create a foundation of a good loan profile. But in India, except for a few private banks like ICICI Bank, Yes Bank, other banks are very slow in adoption of AI.

Quick movers have another advantage in that their AI systems will start learning earlier than others, and will therefore evolve faster as well in resolving the issue of rising NPA in most of the Banks. Similarly, such data can help assess risks for selling and pricing insurance policies. Finally, client interactions may increasingly be carried out by AI interfaces with so-called ‘chatbots,’ or virtual assistance programs that interact with users in natural language.

Applications of AI and machine learning may enhance the interconnectedness of financial markets and institutions in unexpected ways. Institutions’ ability to make use of big data from new sources may lead to greater dependencies on previously unrelated macroeconomic variables and financial market prices, including from various non-financial corporate sectors (e-commerce, sharing economy, etc.). As institutions find algorithms that generate uncorrelated profits or returns, there is a risk these will be exploited on a sufficiently wide scale that correlations actually increase. These potentially unforeseen interconnections will only become clear as technologies are actually adopted.

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