Effective use of Emerging technologies for Leveraging credit appraisal in Indian Banking System

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Abstract

Lending is no longer limited to investigation of the assets side of the balance sheet. Credit Appraisal, risk analysis and lending decisions should be considered while keeping in mind the broad framework of corporate banking strategy. The objectives of the study are to explore the concept of credit appraisal and to explain the ways to use the technology for effective credit appraisal and also to study the challenges and limitations of use of technology in credit appraisal. To embrace the technological advancements effectively in credit appraisal, a strategic and holistic approach is required. Financial institutions that invest in data quality, advanced analytics, cybersecurity, financial inclusion, regulatory compliance and human-machine collaboration position themselves to thrive in a rapidly evolving financial landscape. With the application of these strategies, institutions can harness the full potential of technology to enhance credit appraisal processes and stay competitive in the dynamic financial industry.

Introduction

In our fast-paced digital age, every bank and financial institution is looking for growth in market. For this purpose, they are to adopt a healthy portfolio consisting a balanced approach towards investment and lending. The lending to various customers attracts risk. To estimate and minimise the risk and defaulting customers, banks and financial institutions used to analyse the salary records in case of individual customers, whereas, in case of companies, Profit and Loss Statement and Balance sheet, especially, assets of the companies are considered before sanctioning the loan. The credit in itself is exposed to risk and it might happen that disbursed loan amount is not be returned by the borrower. To combat this, banks and financial institutions have to adopt credit appraisal system in an effective manner.

Credit Appraisal

Credit appraisal is the process of evaluating the creditworthiness of a borrower or a potential borrower. It involves assessment of various factors, such as financial statements, payment history, purchasing power and other factors. To determine the risk associated with lending funds to an individual or a company (FasterCapital, 2023). The goal of credit appraisal is to determine whether to accept or reject a loan proposal and to set appropriate loan limits, terms and conditions. Different methods and tools are used in credit appraisal, including traditional credit-risk analysis data, profiling customer behaviour and utilizing blockchain technology.

The use of credit assessment methods and systems that incorporate personalised credit control information and social circle information can improve the accuracy and reliability of credit evaluation results (Varathan, Kalyanasundaram, & Tamilenthi, 2012).

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The goal of credit analysis is to assign a risk rating to both the borrower and the proposed lending facility (Sharma & Kalra, 2015). The risk rating is calculated by estimating the borrower's probability of default at a given confidence level over the life of the facility, as well as the amount of loss suffered by the lender in the event of default. As previously stated, credit appraisal is concerned with three major issues: the problem of adverse selection, the measurement of exposure to risk and the assessment of default risk. The traditional approach to credit analysis entails examining the five C's i.e. Character, Capacity, Capital, Collateral and Conditions and calculating a credit score based on a predefined weighted matrix, i.e. Credit risk is measured using three key components: probability of default, exposure at default and loss given default (Srivastava, 2019). Credit appraisal, an important risk management tool for banks and financial institutions, allowing them to accurately estimate defaults in loan applicants and make informed decisions in the lending process (Abdoli, Akbari, & Shahrabi, 2023). Traditional approaches to credit appraisal primarily use financial statement analysis techniques to assess the creditworthiness of potential borrowers. However, such analysis falls short of providing a 360-degree view of the potential borrower, necessitating the implementation of more accurate, incisive and comprehensive methods (Srivastava, 2019). This leads to realise the importance of innovative ways to use technology in effective and efficient credit appraisal.

The Role of Technology in Credit Appraisals

Effective credit appraisal can be achieved through the use of technology. Technology in credit rating systems, such as the proposed cross matrix system, provide valuable information for managing technology credit funds (Lee & Kim, A Study on the Effective Combining Technology and Credit Appraisal Information in the Innovation Financing Market, 2017). Additionally, the application of intelligent technologies, such as big data and artificial intelligence algorithms, can improve risk control and enhance credit risk management in commercial banks (Moon, Kim, & Sohn, 2011). Machine and deep learning models can also be utilized to predict loan default probability and improve decision making in lending institutions (Wang, Jin, & Li, 2023, March). These models can help identify important features for loan default prediction and assess the stability of binary classifiers (Addo, Guegan, & Hassani, 2018). The use of technology in credit appraisal can be categorised into four categories: Automated Data Collection, Machine Learning and Artificial Intelligence, Streamlining Processes with Digital Documentation and Enhancing Accuracy.

Automated Data Collection for Credit Assessment

Automated data collection for credit assessment is also a crucial area of research. Several studies have proposed various methods to automatically search and construct credit scoring models based on credit data (Yang et al., 2021). These methods aim to improve the performance of computerized credit assessments, which are currently not perfect (Hayashi, 2016). Artificial intelligence (AI) techniques have shown promising results in predicting credit ratings, but there is still room for improvement (Wang & Ku, 2021). Automated classification methods, trained on datasets representing companies with known credibility, have been used to perform credit rating assessments (Hajek & Michalak, 2013). Additionally, the use of automated tools, such as the R package autoRasch, can optimize the analysis of credit data and perform Rasch analysis in a semi-automated way

(Wijayanto et al., 2023). These approaches contribute to the automation and accuracy of credit assessment processes (Figure 1), enhancing the reliability of credit assessments in various industries.

## Figure 1: Automated Data Collection for Credit Assessment

Source: Authors' study

Machine Learning and Artificial Intelligence in Credit Appraisals

Machine learning and Artificial Intelligence (AI) have a strong influence on credit risk assessments (Mehndiratta et al., 2023) by using various data sources and allowing lenders to analyse credit risk and assess the behaviour of customers (Mhlanga, 2021) as shown in Figure 2. Machine learning models, such as collaborative classifiers and neural networks, outperform traditional models in credit scoring (Tyagi, 2022). In Machine learning, the most popular term is "feature selection techniques". These technologies offer more precise predictions and help financial institutions in evaluating the credit risk (Medina, 2023). By using different feature selection techniques and machine learning classifiers, accuracy and performance of credit scoring prediction models can be improved (Trivedi, 2020). Machine learning algorithms are used to estimate the type of credit risk associated with a credit applicant and compare different scenarios using balancing methods, feature selection technique and predictive algorithms (Faletti, 2023; Tripathi et al., 2021).

The positive impact of AI-based credit analysis on macroeconomic growth emphasized along with discussion on role of artificial intelligence in credit

analysis improvement and financial inclusion and credit access for traditionally underserved borrowers on a micro scale through identification of potential biases as well as ethical, legal and regulatory issues with AI-based credit analysis processes. (Sadok, Sakka, & El Maknouzi, 2022). Additionally, explainability techniques like LIME and SHAP are used to measure and explain the decisions made by machine learning-based credit scoring models. The transformative potential of Artificial Intelligence (AI) within the banking sector has ushered in an era of unprecedented efficiency, innovation and customer-centric services. Yet, this remarkable progress has not been without its ethical challenges and potential biases (Valavan, 2023).

Figure 2: Machine Learning and Artificial Intelligence in Credit Appraisal
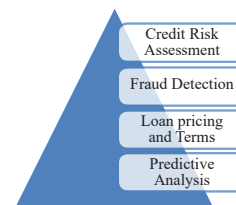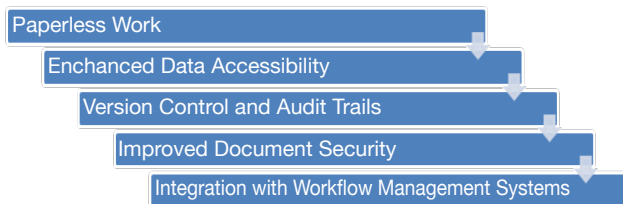

Source: Authors' study

Streamlining Credit Appraisal Processes with Digital Documentation

Digital document analysis is a system used for evaluating an appraisal theme in credit appraisal and it is considered as more competent and safer for environment (Figure 3). It involves revising documents to extract appropriate data and features and it involves no physical use of paper which also leads to no loss or misplace of the information. The accuracy of the analysis is crucial, as an inappropriate selection can lead to failure of the entire process (Cook, 2006). This will also help the credit appraiser to track the changes & upgradation and there would be more transparency

and accountability on both the sides. In this way, digital documentation tool helps in protecting the sensitive information through encryption, limited access and authentication of user. With the use of digital tools, credit appraisal process can be efficiently improved with less chances of manual errors. As a result of which, there would be faster turnaround times, better customer experiences and a more environmentally sustainable credit appraisal process for financial institutions (FasterCapital, 2023).

Figure 3: Streamlining Credit Appraisal processes with Digital Documentation

Source: Authors' study

Enhancing Accuracy with Technology

Enhancing credit appraisal data accuracy with technology can be achieved through various methods. One approach is to utilize technology to collect and analyse information of applicants to create an effective credit appraisal system (Lee & Kim, 2017). By using blockchain technology, the transactions can be made more secure and transparent by reducing the risk of fraud and enhancing the integrity of financial data. Additionally, data mining techniques (Liu & Zhang, 2021, April), specifically, data transformation techniques, can play a crucial role in increasing the accuracy of credit card screening predictive models (Suebsing & Vajiramedhin, 2013). Furthermore, accessing other databases and incorporating alternative data, such as email usage and psychometric variables, can improve the predictive accuracy of credit risk models

for individuals with insufficient credit history (Patent, 2014). By combining these approaches, financial institutions can enhance the accuracy of credit appraisal system and make better lending decisions (Figure 4).

**Figure 4: Enhancing Accuracy with Technology**

Source: Authors' study

Using Big Data Analytics for Risk Assessment in Credit Appraisals

Big data analytics has transformed credit evaluations by providing financial institutions with a powerful tool for more accurate risk assessment and informed lending decisions (Halkarnikar et al., 2023). The Big data information source could be borrower's purchase history, social media history even browsing history can help the financial institutions to recommend the personalised product. The same information can be provided by E-commerce companies. Big data analytics enables a holistic evaluation of credit risk by uncovering nuanced patterns and improved decision-making through comprehensive risk profiling, identification of hidden correlations, real-time monitoring, predictive analytics and fraud detection (Figure 5). The ability to analyse large datasets from multiple sources ensures more accurate credit risk assessment, refining risk models and facilitating precise credit decisions. Real-time monitoring and predictive analytics enable financial institutions to address potential risks more proactively, minimizing losses and mitigating the impact of credit defaults. While leveraging the power of big data analytics provides significant benefits, institutions must prioritise high-quality data.

Figure: 5 Using Big Data Analytics for Risk Assessment
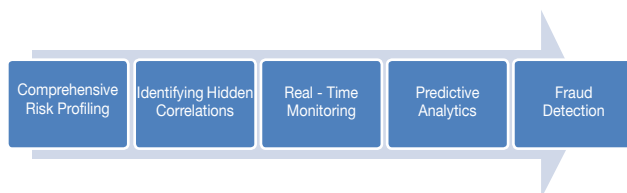
Source: Authors' study

Ensuring Data Security and Privacy in Technology-driven Credit Appraisals

In this digital intelligence era, it is very crucial to ensure data security and privacy in technology-driven credit appraisals. Several studies have proposed novel credit evaluation systems based on blockchain technology to address these concerns. These systems incorporate modules (Figure 6) such as data encryption, access control, secure computation and model storage to protect data privacy and ensure authenticity (Qiao et al., 2022). With the use of certain mathematical and encryption techniques, at the time of sharing data will remain safe and will help in protection of privacy and preventing any potential data leaks (Qiao et al., 2022, December). Additionally, the proposed systems allow for secure data sharing and privacy protection in multiparty computing, ensuring that final statistical results can be obtained without exposing raw data (Yang et al., 2022). The integration of distributed ledgers, access control, security aggregation and model storage modules in Hyperledger Fabric Blockchain Technology based systems further enhances data privacy and collaborative computation (Yang et al., 2022). These approaches optimise data privacy by sharing data models instead of revealing actual data, ensuring secure storage and sharing of credit information (Yang et al., 2022).

Figure 6: Ensuring Data Security and Privacy in Technology-Driven Credit Appraisal

Source: Authors' study

Challenges and Limitations of Technology in Credit Appraisal

Though technology offers several benefits, its application in credit appraisal comes with its some set of challenges and limitations as shown in Figure 7.

Figure 7: Challenges and Limitations of Technology in Credit Appraisal

Source: Authors' study

The effectiveness of Credit appraisal using emerging technologies is dependent on data accuracy, emphasizing that automated tools and machine learning models are as reliable as the data on which they are trained. Over-reliance on automation may result in the omission of contextual factors considered by human analysts while using traditional methods. The lack of explanation and transparency in advanced machine learning models may create difficulties for stakeholders and may raise concerns about fairness and bias. The widespread use of technology in financial institutions creates vulnerabilities to frauds and cybersecurity threats, necessitating stringent safeguards to protect sensitive data and maintain customers' trust. While developed economies embrace advanced technologies quickly, emerging markets face challenges in infrastructure, connectivity and

digital literacy, potentially excluding some segments of the population from formal credit systems.

The changing regulatory environment necessitates adaptability in technology-driven credit appraisal systems. Changes in regulations, creates uncertainty and necessitate frequent updates. In decision-making, automated systems may lack the human-touch and empathy, raising ethical concerns about potentially impersonal or biased outcomes. Striking a balance between technological innovation and human-touch is critical for developing a robust, accurate, transparent and ethical credit appraisal system. To shape the future of credit assessments, financial institutions must navigate these challenges responsibly.

Strategies to Embrace Technological Advancements

Strategies to embrace technological advancements in credit appraisal include leveraging Big Data Analysis (BDA) and Artificial Intelligence (AI) (Berrada, Barramou, & Alami, 2022, February; Sadok, Sakka, & El Maknouzi, 2022). These technologies offer various applications for the banking industry, such as supports in segmentation, customised service, customer relationship management, fraud detection and credit risk assessment (Bazarbash, 2019). Machine Learning (ML) methods, including supervised and unsupervised learning, as well as deep learning with artificial neural networks, have shown promising results in credit risk assessment (Reis & Quintino, 2023). FinTech lending, which utilises ML-based credit assessment, has the potential to enhance financial inclusion and outperform traditional credit scoring by leveraging non-traditional data sources and forecasting income prospects (Berrada, Barramou, & Alami, 2022, February).

It is critical to prioritise data accuracy and timely updates, with robust integration systems facilitating seamless data flow across internal and external sources. Using advanced analytics and Machine Learning, especially, predictive modelling, improves credit risk assessment precision, allowing for faster decision-making and identifying subtle risk factors. Transparency in algorithmic models is critical for fostering stakeholders' trust and addressing fairness concerns. Cybersecurity and fraud detection algorithms protect sensitive financial data, instilling customers' trust. Financial inclusion via mobile banking and digital platforms with user-friendly interfaces expands market reach and improves customers' experience. Regular regulatory compliance monitoring reduces legal risks, protects institutional reputation and ensures the long-term viability of technology-driven credit processes. Human-machine collaboration results in holistic credit assessments that are adaptable to changing regulatory requirements by combining automated efficiency with human judgement. A harmonious combination of technology and human-touch contributes towards implementing informed lending decisions that take both quantitative and qualitative factors into account.

Conclusion

As technological advancements continue to reshape the financial landscape, embracing innovative solutions in credit appraisal is imperative for financial institutions seeking efficiency, accuracy and competitiveness. Effectively embracing technological advancements in credit appraisal requires a strategic and holistic approach. Financial institutions that invest in data quality, advanced analytics, transparency, cybersecurity, financial inclusion, regulatory compliance and human-machine collaboration position themselves to thrive in a rapidly

evolving financial landscape. By implementing these strategies, institutions can harness the full potential of technology to enhance robustness of credit appraisal processes and stay competitive in the dynamic ever-changing financial industry.

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