

# HOW INNOVATION PLAYS A ROLE IN BANKING AND INCREASES PROFITABILITY

Umbaruk Kieta Phnum<sup>1</sup>

<sup>1</sup>*Universitas Indonesia, Indonesia*

[umbaruk@asia.com](mailto:umbaruk@asia.com)

## Abstract

Banking as an extensive information subject is constantly changing under the marketing influences of the era of huge information. Checking out the revolutionary important specifics analytic sources, as Data Mining techniques are essential for the banking business. This aims to reveal valuable information from the vast length of info and realize far better strategic management in addition to client pleasure. To provide decent assistance for future research and development, a most thorough present analysis of the existing study problem of DM in banking will be unbelievably beneficial. Since pre existing ratings just tackle the applications until 2013, this specific newspaper seeks to run this specific exploration gap, and also supplies the sizable progressions and most current DM implementations in banking document 2013. By collecting and analyzing the fads of review concentration, info online resources, specialized aids, and info analytical online resources, this specific newspaper helps obtain important insights about the succeeding developments of equally DM together with the banking business, in addition to a comprehensive one stop guide table. Furthermore, we recognize the main obstacles and also provide a summary for all those interested in big data.

## Keywords

Banking, Innovation, Profitability

## JEL Classification

M35, M41

DOI: <https://doi.org/10.14311/bit.2023.02.09>

**Editorial information:** journal Business & IT, ISSN 2570-7434, CreativeCommons license  
published by CTU in Prague, 2023, <http://bit.fsv.cvut.cz/>



## Introduction

The era of big information came together with both giant opportunities and challenges. Almost all science topics are experiencing overflowing information at unexpected volumes & velocities. As an outcome, revealing the concealed information in big information by Data Mining techniques is now an emerging pattern, as well as supreme goal for a broad range of research [three]. As a data extensive issue, banking is a popular implementation location for scientists with DM abilities in the past many years of the information science revolution. Banks have recognized that expertise, not monetary resources, is the biggest advantage of the novice driver. Furthermore, the expansion and popularity of e-banking and mobile banking improves the exponential growth of authentic time banking info. These constant developments, and the rapidly improving accessibility of big information, do mastering associated huge data analytics tools, nearly the most crucial factors for the banking business [two].

Along with considerable research of existing literature, we've just two review documents centered on the DM utilizes in banking, along with every mentioned DM implementation just before 2013. For such a rapidly developing subject, which progresses each day, it is crucial to provide interested parties and researchers with probably the most current state of DM, and also banking collaborations [four]. As an outcome, we totally assess the DM utilizes in banking, especially for the most recent years, after 2013. It is noteworthy that we will not replicate the contents tackled within, but only focus on probably the most current created DM applications in the banking business. This specific paper seeks to perform as likely the most present individual stop directory hand for relevant researchers, and also apprise them from the evolution of serious details analytics in banking, with an outlook for succeeding scientific studies [seven].

Having summarized the newest applications, huge information in deep banking was exploited for improving customer satisfaction, marketing, and strategic command. Especially, the newest applications gathered in this particular paper targeted primarily four topics: protection, fraud detection, risk management, and investment banking, customer relationship management, together with additional complicated supports. Furthermore, this specific paper contributes by gathering and analyzing the information of DM techniques, software, and data resources. Thus, the things in this specific assessment assure the novelty of its as well as crucial contributions to the present gap in academic literature [eleven].

The majority of this newspaper is organized as the strategy is supplied in Section2; the worth advancement of DM found banking by topics along with a summarized manual table are evaluated in Section3; the main element software program as well as methods manner are briefly summarized around Section4; Section5 finally concludes and also proposes directions and challenges for later studies.

## Literature Review

To have assessed more than 100 probably the newest DM applications within banking written content 2013, it might be often found that the banking business largely adopts DM techniques for the adhering to purposes: Security in addition fraud detection: Big secondary specifics as transaction documents are administered and also examined to enhance banking security and distinguish the abnormal action along with patterns indicating fraud, phishing, or perhaps money laundering. Risk management in addition to buy banking: Analysis of in-house credit card info immediately accessible for banks enables credit scoring and recognition giving, which are the most preferred sources for risk management as well as investment evaluation [five]. CRM: DM strategies have been widely used in banking for marketing, in addition to client relationship management attached reasons, which include customer profiling, customer segmentation, then simply cross/up selling. These help the banking business comprehend their customers, predict customer behavior, successfully focus on potential customers, and further increase consumer complete pleasure with a strategic program layout.

Extra complicated supports: A few less mainstream apps target branching performance analysis, productivity, and strategy, which could significantly help attain strategic branch finding and development programs. In what uses, we briefly assess the collected publications in terminology of the places of interest [six]. Furthermore, to perform as the one stop manual directory for all those present DM applications in banking posts 2013, a summary dinner table is found with Table1, the location in which the literature is classified utilizing benefit advancement, jointly with extensive information as info resources/regions, and also DM strategies adopted. Remember that most implementations are applied to more than one DM technique, and some apps did not clarify the details due to confidential restrictions.

Protection as well as Fraud Detection To help keep the high standards of defense amidst the vast flow of big banking info, in addition to the rapidly growing scale and complexity of cyber crimes, researchers are actually visiting advanced DM techniques to effectively pinpoint rare fraud conduct. Keep in mind that a present comment which targeted cost card processing is found to. By an internal view, the survey info of bank employees in India is gathered to assess their perceptions of fraud.

Many researchers worked with transaction info, seeking more effective techniques to distinguish between patterns from genuine conduct with improved efficiency and accuracy. Among these, Wei et al. proposed a framework named I Alertor for substantial Australian banks; a semi monitored option assistance system known as BankSealer was recommended for an Italian bank; writers in proposed a hybrid automobile DM method to count on community intrusions and determine fraud activities; FraudMiner style and design that integrated frequent goods mining was released in and confirmed with the info set from UCSD DM match [eleven]. A comparative evaluation tackled the ensemble technique to produce classifiers; of problems linked to a recently accessible advancement of FraudMiner, the freelance writers in unveiled the LINGO clustering technique for the look matching procedure, that growth truly helped enjoy a gratifying performance in respect to precision while more decreasing the wrong security alarm rate; Behera and Panigrahi demonstrated the hybrid way of charge card fraud detection by pairing Fuzzy NN and also Clustering techniques, and also attained greater than 90.3 % accuracy with all of the dataset made within; APATE was suggested to for automated fraud detection within a huge cost flash memory card issuer in deep Belgium; each Luhn's as well as Hunt's algorithms are utilized around for proposing a novel procedure of control card fraud detection; the writers in illustrated the use of DM techniques on client info to place in a much better level of authentication to banking businesses for real period fraud detection; across types strategy pairing genetic NN as well as algorithm was suggested in for Greek companies within the banking sector; a framework named FDiBC was developed to for fraud detection within the Saman Bank in Iran; an e banking safety unit employing Cryptography and Steganography was launched in 4 stopping online banking fraud [eight].

Along with the main implementations of transaction info, the authors dedicated themselves to phishing detection from realized banking websites. They utilized a multi label classifier primarily based associative category DM for successful detection of phishing in websites with too much accuracy. To improve the customer charge card churning prediction for just a Latin American bank account, the authors followed improved DM techniques, grounded on K implies clustering, and help vector products. Blog mining was utilized in, where security chances, security strategy, and safety trends of movable banking were summarized from more than 200,000 results of the Google blog website search engine.

Furthermore, scientists paid extra attention to money laundering detection. For instance, a DM style is offered to that put on K implies clustering, as well as Association Rule Mining for pinpointing suspected sequence of income laundering methods. A novel technique identified as Bitmap Index dependent DT was recommended for examining the possibility element of cash laundering with Statlog German recognition info. Many of the newest applications used DM techniques for credit scoring worldwide within the banking sectors. A savings account of Indonesia was analyzed in. Chen et al. examined information from 16 outlined Chinese manufacturing banks, even though the info set from the Export Development Bank of Iran was analyzed in [twenty one]. Koh et al. constructed two phase ways for credit scoring over the site in a German savings account. Furthermore, while using the German recognition scoring dataset, Harris demonstrated the clustered SVM classifier for recognition scoring, and Zhao et al. offered the greater Multi Layer Perceptron NN sort by employing the back propagation algorithm. The authors proposed the credit risk evaluation program with all the help of exterior evaluation and sliding windowpane testing; it was confirmed on real life data from EDGAR.

It is noteworthy that you will find a few research studies which primarily precise classification techniques, in addition to their applications in credit scoring, taking about extensive analysis communities. For instance, Lessmann et al. discovered investigation appropriate until 2014, and also conducted considerable trials with real life Australian and German recognition data sets for choosing the ideal classifier. Louzada et al. lately created an organized review focused solely on the apps of category techniques for credit scoring [twenty two]. At this stage, the main classification methods for credit scoring were summarized and produced jointly with an extensive analysis of theoretical and paradigm trends. A present distant relative exploration conducted assessments on recognition data sets through six areas to place, and also recognized perhaps the greatest classifier for recognition scoring out of 20 5 various classifiers that have been deemed.

Furthermore, scientists focus on the decision-making procedure of credit granting. Especially, a private bankruptcy device was recommended for poor account prediction, plus was put on the fee card info associated with a Canadian savings account. The authors assessed the ability of credit union participants to settle their commitments [twenty]. A decision assistance procedure for banks was recommended, allowing high institutions to notice account receivables and maintain earnings. With regard to DM applications in deep chance management of peer-to-peer lending, the authors focused on earnings scoring by forecasting the inner fee of go again for a decision assistance process of P2P lending. An try things out verified the suggested design and style contemplating US Lending Club info. Furthermore, research in adopted LR and K-means clustering techniques for detecting terrible recognition scores for P2P lending info. Recently, Xia et al. used three real life credit info sets, together with two P2P lending info sets, to evaluate the performance of a recently suggested program that used serious gradient increasing in addition to Bayesian hyper parameter [twenty three].

## Methods

We stick to the methodology offered in thinking about the advanced investigation look of its, that's definitely demonstrated to the person. First of all, as clarified in the final portion, the analysis scope is referred to as the DM utilized in banking report 2013. The search process uses the standard process by identifying a choice of phrases. Where we used the sizable keyword phrases for likewise DM as well as banking methods, including banking, fraud detection, fee flash memory card, recognition scoring, chance managing, deposit, mortgage, debit, mortgage, CRM, bank account marketing; and also data mining, clustering, text mining, group together with various other particular DM technique problems. It is noteworthy that the pairwise searching technique is conducted while ensuring that one phrase out of each portion is represented. Moreover, the search focuses entirely on reliable academic sources from top seminars and top journals.

## Findings

CRM is "a complete strategy, in addition to the process of acquiring, retaining and partnering selective buyers to produce exceptional worth for the company and the customer", and the DM strategies have overwhelmingly impacted it. A previous comment of DM applications in CRM about an extensive exploration scale was published, meticulously reviewing linked literature of place until 2008, together with a recently accessible simple comment found in. Nevertheless, in conditions of the specific interest of the banking business, only one short comment is realized to covering literature in spot until 2013. The symbolic framework of customer analytics in banking is iCARE dependent on IBM. More details of its solutions, together with a real case study for a company bank account of Southeast China, might be found with [fourteen].

**Buyer Knowledge and Profiling** To construct an actual client profile, it is essential for banks to acquire valuable information from the buyer's conduct with all the assistance of DM methods. Mansingh et al. demonstrated the use of DM techniques on survey info of internet banking proprietors in Jamaica, which much more helped in the decision-making process of evaluating attitudinal, behavioral and demographic variables collectively for the aim of profiling and also prediction. By concentrating on the info obtaining procedure, the web info imputation framework incorporating DM strategies was developed, as well as verified from an application of authentic banking data sets [sixteen].

To better understand mobile banking customers, and also implementations of client centric methods, Noori proposed the customer segmentation sort for an Iranian savings account. After, the authors unveiled a framework based on transaction driven details for best segmentation of a bank's customers [twelve]. Apart from the continuous exploration of the above mentioned Portuguese solid marketing dataset, Shih et al. provided an objective advertising sort for business banks due to the personal mortgage service. Therefore, the test was conducted together with the info from a cost savings bank account found in Taiwan. Combined with the good marketing information set of a Turkish bank account, Mitik et al. proposed a two stage hybrid application, after which they completed promising precision and a huge increase in the entire profit/cost ratio [seventeen]. Wang and Petrounias assessed the associations between mobile banking and demographic attributes of China, with excellent information collected through questionnaires. This specific application can help guide the improvement of advertising methods for home banks in China [thirteen].

DM techniques can also be utilized to maintain and improve banking client satisfaction. As a good example, in Spain, the main determinants of loyalty for banking customers are analyzed using DM strategies. Most DM uses in customization and customer development centered on advertising connected things. The bank steer marketing info sets coming from Portuguese banking institutions have been desirable details vitality plus was analyzed exactly where compared the shows of four unique DM category techniques [eighteen]. The same dataset was used to verify the suggested approach, in that a correlation primarily based distinctive subsection selection algorithm was utilized with the info set balancing approach. Afterwards, an ensemble framework produced this specific device. Furthermore, a profits-driven man-made NN approach was recommended, together with a comparable evaluation of two methods of sort of K mean clustering and classification. Recently, Lahmiri proposed a two stage procedure that combined a NN ensemble design, in addition to Particle Swarm Optimization, for optimizing the initial weights of every NN within the ensemble framework. This was established by the bank's powerful marketing info with outstanding performance in relation to the baseline methods [nineteen].

Main DM Techniques, Software for Banking and Trends Along with the detailed analysis of over 100 publications by topics, the main element DM strategies employed in banking are discovered, such as bunch evaluation, connection guideline mining, and also class methods, which includes but are not restricted to Decision Trees, Neural Networks, Support Vector Machines, Naive Bayes, along with Logistic Regression. Keep in mind that a brief basic summary of these DM strategies might be found in. This specific analysis also uncovers the fads of DM apps, and also techniques in banking, based on the main element information from the defined newest uses. Keep in mind that the following data diagrams are attained based on the physically filtered information from the assessed publications. Certain apps did not make clear these particular information because of confidentiality connected restrictions.

Depending on Figure2, CRM apps account for roughly 30% of assessed publications, and also confirms the easy truth suggested by which more than 80 % of financial service groups internationally show customer expertise as the main priority of its. In just a few CRM shows, about one-third of the implementations goal customized marketing, in addition to cross/up marketing, accompanied by acquisition and client retention, covering a lot more or perhaps a reduced amount of 1/3 of CRM implementations. Recent analysis actually tackled the significance of fraud detection and chance management, because they constitute 20 8 %, together with 20 6 % of the entire uses. This is due to the emerging need for battling cyber crime and producing more advanced solutions. Weka, Matlab and SPSS are the most popular apps adopted, accompanied by Rapidminer.

Although there are around 30% of publications which did not clarify the application information, these facts will probably help the correct investigation parties find corresponding analytical cures or perhaps researchers with relative expertise. Most likely, the most often adopted DM techniques are classification 60 % and also clustering 20 8 %. Nevertheless, it is noted that most programs employ a lot more than one DM technique, and mainly papers adopting classification techniques use a lot more than one specific classification technique for comparison purposes. Particularly, K hostile clustering is the most frequently used clustering method, so the best three classification techniques are SVM. ARM, DT, or maybe NN seems seldom exploited, worrying about its 5 % proportion, and it is also seldom seen integrating interpersonal network or maybe text mining evaluation mining. Thinking about the accessibility of unstructured key banking info from customer profiles, recommendations and call center files, you can find overwhelming potentials for many DM strategies that have not been analyzed before.

## Conclusion

This specific paper adequately shot and systematically reviewed roughly a huge selection of DM uses in banking document 2013. It fulfills the literature gap and will serve as a quick resource manual for the most recent DM implementations in banking. To have reviewed these current publications, it can be recognized that the banking sector has adhered to DM chiefly for fraud detection, CRM. and also chance managing Additionally, almost all apps use a lot more than simply a single DM technique, among which clustering as well as category show sufficient evidence of every acceptance as well as applicability [nine].

Although the growing interest and promising shows have mirrored the values and potentials of DM applications in banking, the obstacles of utilizing these specific techniques on big banking info remain noteworthy, as a good example, the expensive in addition to time comprehensive practice of personnel education to information, as well as design identification preprocessing, adaptable option, complexity and difficulty of info quality assurance, big dataset storage along with maintenance, etc. Along with the entire summary of the newest improvements of DM applications in banking, this particular study seeks to offer insights into the issues, as well as directions for later studies. First of all, it's talked about that although the main banking info includes enormous volumes of unstructured details, you'll discover numerous

DM strategies which remain rarely exploited, e.g. text mining, entity extraction, together with interpersonal society evaluation. The limited access could provide this unbalanced exploration condition to big banking data, the absence of researchers with relevant skill sets, technique constraints, and competent data analytic resources. Particularly, the confidentiality limits of banking attached specifics have limited the improvement of the study. Consequently, looking for a very good option for information accessibility can make a significant difference for future research [one].



As for the method of value development by DM applications in banking, the banking market has acquired enough plentiful customer information, in addition to the current implementations simply focusing on the advertising and marketing factor. There's tremendous opportunity and information that is valuable longing to be found. Furthermore, an enormous proportion of information channels, like call center, purchaser surveys, along with social media, continue to be longing to get totally exploited. As a trending technique, machine learning programs, especially serious learning, were the appearing focus of many health studies. Appropriately, it might be anticipated as a further substantial path for the banking business to much better follow the era of big information [ten].

Finally, as an extra suggestion of prospective labor, the evaluation of a new analytical manner could additionally be important for the banking business, which aims to offer ways for three utilize variations. Meanwhile, new specialized ways within the era of big information can also continuously change research instructions of DM applications in banking. For instance, the enhancement of cloud computing could significantly improve the computational performance of numerous pre existing frameworks, even though the popularization of Internet of Things more enhances the essential info online resources. It might additionally favorably impact the placed analytics and also the development of essential huge data analytics networks

## References

- [1] AKTER, J. S., & Haque, S. M. (2022). Innovation Management: Is Big Data Necessarily Better Data?. *Management of Sustainable Development*, 14(2), 27-33.
- [2] JAHAN, S. A., & Sazu, M. H. (2022). Factors Affecting The Adoption Of Financial Technology Among The Banking Customers In Emerging Economies. *Financial Studies*, 39.
- [3] JAHAN, S. A., & Sazu, M. H. (2022). Role of IoTs and Analytics in Efficient Sustainable Manufacturing of Consumer Electronics. *International Journal of Computing Sciences Research*, 6.
- [4] JAHAN, S. A., & Sazu, M. H. (2022). The Impact of Data Analytics on High Efficiency Supply Chain Management. *CECCAR Business Review*, 3(7), 62-72.
- [5] KANG, H. S., Lee, J. Y., Choi, S., Kim, H., Park, J. H., Son, J. Y., & Noh, S. D. (2016). Smart manufacturing: Past research, present findings, and future directions. *International Journal of Precision Engineering and Manufacturing-Green Technology*, 3(1), 111-128. doi:<https://doi.org/10.1007/s40684-016-0015-5>
- [6] KUSIAK, A. (2017). Smart manufacturing must embrace big data. *Nature*, 23-25. Moyne, J., & Iskandar, J. (2017). Big Data Analytics for Smart Manufacturing: Case Studies in Semiconductor Manufacturing. *Processes*, 5(3). doi:<https://doi.org/10.3390/pr5030039>
- [7] RAUT, R., Narwane, V., Mangla, S. K., Yadav, V. S., Narkhede, B. E., & Luthra, S. (2021). Unlocking causal relations of barriers to big data analytics in manufacturing firms. *Industrial Management & Data Systems*, 121(9). doi:<https://doi.org/10.1108/IMDS-02-2020-0066>
- [8] SAHOO, S. (2021). Big data analytics in manufacturing: a bibliometric analysis of research in the field of business management. *International Journal of Production Research*, 1-29. doi:<https://doi.org/10.1080/00207543.2021.1919333>
- [9] SAZU, M. H. (2022). Does Big Data Drive Innovation In E-Commerce: A Global Perspective?. *SEISENSE Business Review*, 2(1), 55-66.
- [10] SAZU, M. H., & Jahan, S. A. (2022). Can big data analytics improve the quality of decision-making in businesses?. *Iberoamerican Business Journal*, 6(1), 04-27.
- [11] SAZU, M. H., & Jahan, S. A. (2022). High efficiency public transportation system: role of big data in making recommendations. *Journal of process management and new technologies*, 10(3-4), 9-21.

- 
- [12] SAZU, M. H., & Jahan, S. A. (2022). How Analytics Can Improve Logistics And Supply Chain In Multinational Companies: Perspectives From Europe And America. *Business Excellence and Management*, 12(3), 91-107.
- [13] SAZU, M. H., & Jahan, S. A. (2022). How Big Data Analytics Impacts the Retail Management on the European and American Markets. *CECCAR Business Review*, 3(6), 62-72.
- [14] SAZU, M. H., & Jahan, S. A. (2022). How Big Data Analytics is transforming the finance industry. *Bankarstvo*, 51(2), 147-172.
- [15] SAZU, M. H., & Jahan, S. A. (2022). Impact of big data analytics on business performance. *International Research Journal of Modernization in Engineering Technology and Science*, 4(03), 367-378.
- [16] SAZU, M. H., & Jahan, S. A. (2022). IMPACT OF BIG DATA ANALYTICS ON DISTRIBUTED MANUFACTURING: DOES BIG DATA HELP?. *Journal of process management and new technologies*, 10(1-2), 70-81.
- [17] SAZU, M. H., & Jahan, S. A. (2022). The impact of big data analytics on supply chain management practices in fast moving consumer goods industry: evidence from developing countries. *International Journal of Business Reflections*, 3(1).
- [18] SHAO, G., Shin, S. J., & Jain, S. (2014). Data analytics using simulation for smart manufacturing. *Winter Simulation Conference* (pp. 2192-2203). IEEE. doi:10.1109/WSC.2014.7020063
- [19] THOMPSON, V. A. (1965). Bureaucracy and innovation. *Administrative science quarterly*, 10(1), 1-20.
- Tushman, M. L. (1977). Special boundary roles in the innovation process. *Administrative science quarterly*, 22(4), 587-605.
- [20] VAN RIEL, A. C., Lemmink, J., & Ouwersloot, H. (2004). High-Technology Service Innovation Success: A Decision-Making Perspective. *Journal of Product Innovation Management*, 21(5), 348-359.
- [21] VERBRAKEN, T., Verbeke, W., & Baesens, B. (2014). Profit optimizing customer churn prediction with Bayesian network classifiers. *Intelligent Data Analysis*, 18(1), 3-24.
- [22] WANG, Q., Jiao, W., Wang, P., & Zhang, Y. (2021). A tutorial on deep learning-based data analytics in manufacturing through a welding case study. *Journal of Manufacturing Processes*, 63, 2-13. doi:<https://doi.org/10.1016/j.jmapro.2020.04.044>
- [23] THAYER, L. O. (1968). *Communication and communication systems in organization, management, and interpersonal relations*: Homewood (Ill.) Irwin.
- [24] SUBRAMANIAM, M., & Youndt, M. A. (2005). The Influence of Intellectual Capital on the Types of Innovation Capabilities. *Academy of Management Journal*, 48(3), 450-463.