Original Article

Big Data and Analytics in Financial Services: Transforming Decision-Making and Risk Management

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Abstract - The finance domain has significantly transitioned in recent years due to technological advancements and the rise of big data and analytics technologies and platforms. Hadoop, Elastic Map Reduce, and other techniques have helped financial organizations collect, store, and analyse mammoth amounts of data effectively to make better-informed decisions and enhance overall performance. While these tools enhance decision-making and performance, gaps remain in understanding their strategic implications. In this paper, we investigate the impact of Big data and analytics in the finance industry, emphasising decision-making and risk management and various applications of Big data in this domain, such as Credit risk assessment, fraud detection, and client segmentation. We further explore challenges, including regulatory compliance and data integration, and propose a framework for future research.

Keywords - Finance Technology, Big Data Analytics, Hadoop, Financial Data Processing, Elastic Map Reduce.

1. Introduction

Financial institutions rely on the market, sensitive customer data, and transactional details as their traditional source of information to make business decisions. Data primarily drives this industry, and the rise of Big data and analytics platforms is revolutionizing how these institutions operate to enable them to collect, store, and analyse large amounts of data from various sources (Manyika et al., 2011).

Internet of Things, sensors, social media, etc., are some of the sources that generate data constantly, both structured and unstructured. This data is commonly called Big Data (Gandomi & Haider, 2015). The systematic extraction of valuable insights (Davenport, 2014) from Big Data using advanced technologies like Machine learning, Elastic Map Reduce, Hadoop, or other data platforms is called Analytics in this context.

2. Applications of Big Data and Analytics in Financial Services

2.1. Credit Risk Assessment

By reviewing and analyzing credit history payment patterns and social media activity information from the borrowers, it is possible to carry out the credit risk assessment more effectively and provide accurate results (Bolton et al., 2013). Analyzing and reviewing such humongous amounts of data can be time-consuming and error-prone. Hence,

employing big data and analytics to assess leads to more accurate credit decisions and rapid processing. Financial institutions using big data technologies have reported that this has also helped them reduce the risk of default.

After adopting Big data technologies, the Federal Reserve Bank Of New York observed a significant reduction of 20% in credit risk (Federal Reserve Bank of New York, 2017).

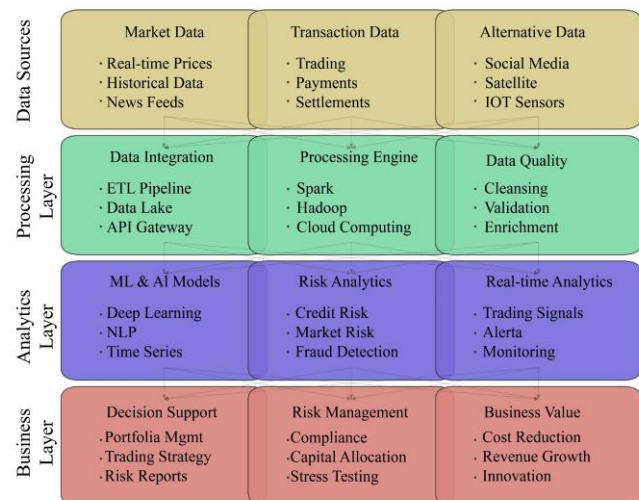Big Data and Analytics in Financial Services

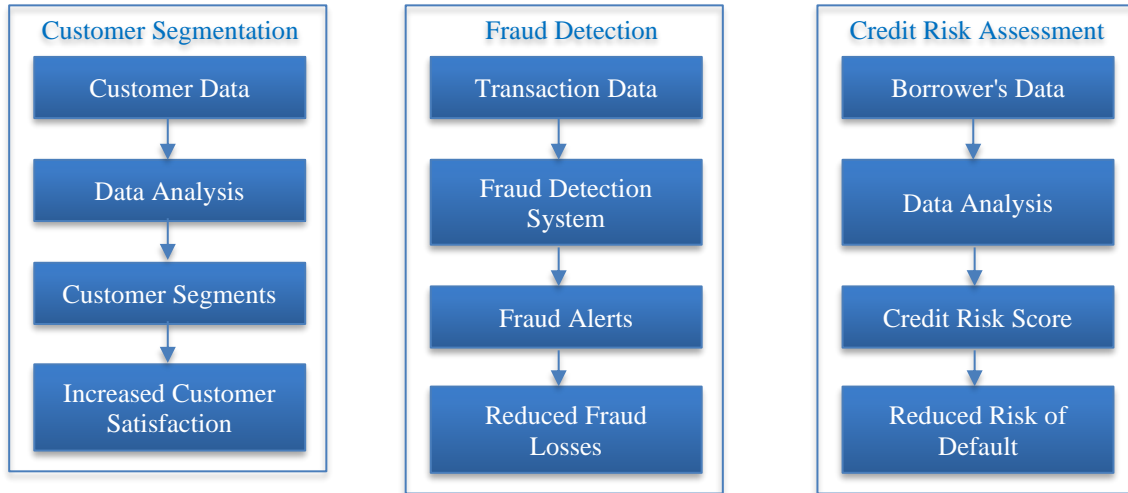**Fig. 1 Big data and analytics in financial services**

Fig. 2 Customer segmentation, fraud detection, and credit risk assessment chart

2.2. Fraud Detection

A study by the Association of Certified Fraud Examiners found that adopting big data and analytics in their pipelines helped them reduce fraud losses by up to 50% (Association of Certified Fraud Examiners, 2018). Fraudulent activities can be mitigated in real-time and enable Financial Institutions to respond swiftly and effectively to detect and protect against potential threats by adopting big data and analytics in their processes (Ngai et al., 2011).

2.3. Customer Segmentation

Based on customers' behavior, preferences, needs, and capacities, customers can be categorized into specific user groups using Big data and analytics (A Gomes, Miguel et al., 2023). Customer segmentation helps financial Institutions customize their products and services to cater to these specific customer groups, increasing customer satisfaction, revenue growth, and loyalty.

3. Challenges and Limitations

It is not an understatement that big data and analytics benefit these Financial Institutions. However, there are also several challenges and limitations that we should take into consideration.

3.1. Data Quality

Big data is generally defined by 4 characteristics - volume, velocity, variety, and veracity, often called 4 Vs. Financial institutions' biggest challenge is coping with this diverse amount of structured and unstructured data, which is of high volume, velocity, and variety, and to ensure their quality and accuracy (Huang et al., 2014).

3.2. Privacy and Security

As the financial domain operates with a lot of sensitive customer data, another major challenge financial institutions face is ensuring the privacy and security of this data (Solove, 2013). This sensitive customer data is vulnerable to cyber-attacks and data breaches and must always be protected. Careful measures must be taken while collecting and conducting any analysis or assessments.

3.3. Talent and Skills

Big data and analytics are relatively new domains within the financial sector, and these institutions are facing a shortage of talented people who are well-equipped with this knowledge. This makes it too difficult to implement, maintain, and operate these technologies (Manyika et al., 2011).

4. Conclusion

Big data and analytics technologies are transforming the financial domain. Employing technologies like elastic map reduces, hadoop, or any other big data platform enables financial institutions to make better-informed decisions, manage risk more effectively and efficiently, and improve their agility and performance. There are several challenges and limitations, but the benefits outweigh the costs. Financial Institutions that fail to equip and adapt to these Technologies will be at risk in this highly competitive market.

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