ARTIFICIAL INTELLIGENCE IN BANKING: TRANSFORMING BANK MANAGEMENT AND CUSTOMER EXPERIENCE

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Abstract:
Digital banking gets great improvements on the basis of the fast growths of ICT technology, in which quick, smooth, and cost-efficient financial transactions are available. This has unlocked many more financial services, products and business opportunities. In recent times industry's most talked about topic is the Digital Banking (DB) revolution. The challenge that has been most detrimental to digital banking transformation is the idea of digital transformation being deferred as simply a technology operations initiative, whilst the primary focus should always be on your customer experience. Digital disruption has changed the standard operating procedures of transaction details and business operations. This paper explores the various ways in which artificial intelligence the banking industry to detect, prevent and manage fraud. Nothing is very assertive; traditional rule-based fraud detection systems sometimes fail to detect in real-time. Artificial intelligence AI has come to the forefront of the financial world today. The new trend of using bank AI adoption in banking uses data-driven solutions towards a more customer-centric approach. Personalization services play an increasingly crucial role in enhancing current customer engagement and attracting new customers. This research studies the applications of AI in banking and the extended benefits to customer satisfaction and overall banking management. This study

aims to evaluate the effectiveness of bank-wide operations in using AI for enhanced customer satisfaction and client engagement. The document explains the use of artificial intelligence in the best possible way for multinational banks. This paper proposes a corporate-based architecture and supports digital AI innovation to assist financial institutions in providing a more personalized customer experience.

Keywords: Transformation of Banking, Artificial Intelligence, Customer Experience, Financial Institution, Banking Innovations

Introduction

The Internet propels both business and consumer purchasing decisions [1]. But that has changed dramatically for the average customer over the last two decades. After holding almost all control over world markets for decades, refrigerated storage, mobile computing devices (including tablets and smartphones), and GPS all revolutionized consumer behavior. Consumers were more dialed in and engaged with their environment and coworkers. Unlike the early 1990s, they relied on a heterogeneous set of service providers [2]. The changing industrial environment and all of its processes have necessitated a digital disruption caused by a changing consumer behavior. The current market environment is an increasingly competitive market environment due to global economic integration and an uncertain business environment. The shortened life cycle of products and services has led to the questioning of this scenario within various sectors, banking being one of them. Due to the rapid growth of information technology and electronic communication, banks are constantly adapting their competitive strategies and organizational structure [3].

The essay aims to identify which banking procedures can be automated with the use of AI and evaluate these processes to enhance the relationship with clients. It seeks to cater to all the metropolitan banks where customers are tech-obsessed, have fast-paced lifestyles, ask for personalization, and look for seamless and frictionless services. However, front-office customer interactions and back-office processes are largely isolated within organizations, and data is collected separately. In “Digital Banking Manifesto: The End of Banks,” the Massachusetts Institute of Technology outlines what digital banking will look like: The existing banks are performing poorly, which presents a unique opportunity to put together a digital bank from scratch. The bank employs advanced technologies such as deep learning, big data, distributed ledger technology, AI, and cryptography for successful operations. Bank will also implement big data analytics and artificial intelligence to improve customer service, automate credit distribution for individuals and SMEs, and maximize risk management [4].

Incumbent banks in Indonesia applying digital banking are transforming to adapt to the new ecosystem driven by increased competition, technical agility, and strategic coherence. Digital banking transformation is based on the dimensions of each institution, and the maturity level of the bank will affect many steps in this journey. The stage of the digital transition phase is shown in Fig. 2 [5].

Digital transformation in the banking industry has raised consumer expectations. Although chatbots and other virtual agents have helped improve customer service, client engagement with these technologies has not met expectations [6]. This gap shows how challenging it is for banks to align their digital transformation initiatives to customers’ needs and experiences.

Since the inception of AI, customer support services have become far more effective. At a Brazilian commercial bank, a study shows that with the help of redundancy systems such as IBM's Watson and similar AIs, over 181 million interactions took place in 2020 and 7.6 million attendances. This improved service efficiency by increasing agility, availability, accessibility, decisiveness, predictability, and transshipment capacity [7]. In contact and customer service centers, the implementation of chatbots has reduced waiting times dramatically, enabling human personnel to focus on more complex issues.

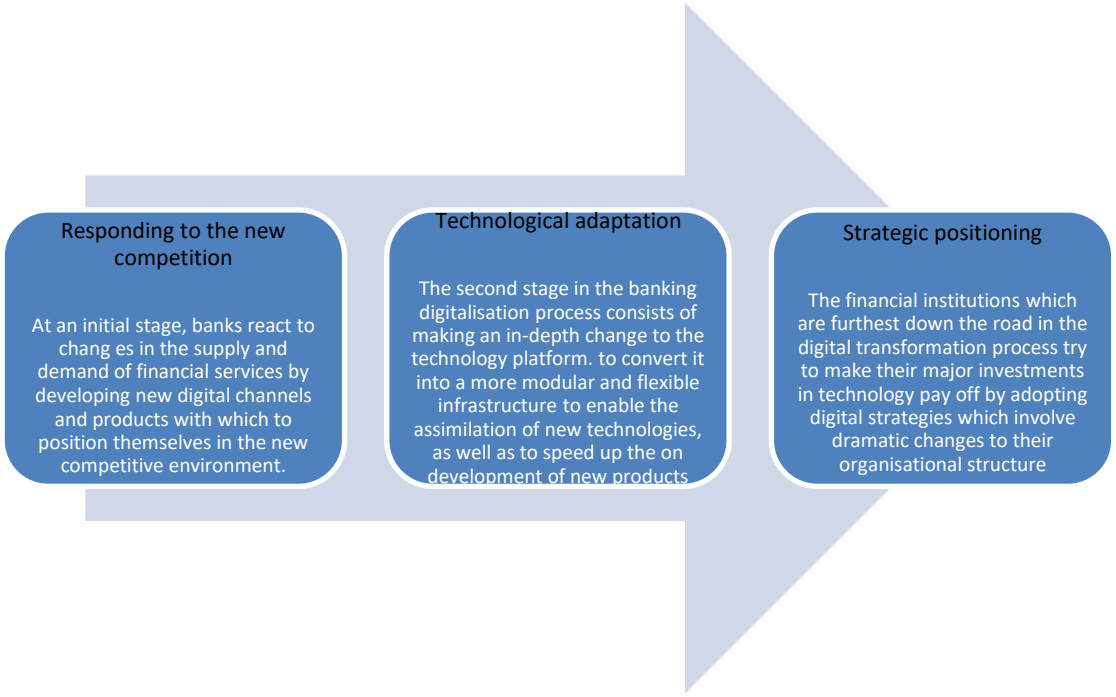

Fig. 1. Digital Banking Transformation [5]

There is also the potential for bias and equity to emerge in the algorithms' decision-making processes. Banking institutions need to perform in-depth assessments and validations of these algorithms in order to ensure they are not biasing certain individuals or groups in compliance with laws and regulations [8].

The introduction of smarter AI-powered algorithms can improve customer satisfaction tremendously in the retail banking sector. By analyzing enormous volumes of data and delivering tailored responses, these methods boost problem-solving, decision-making, and consumer satisfaction [9]. They can help save the company money, which may be passed on to customers and increase their happiness level. Yet to fully benefit from AI-driven algorithm optimization, banks also need to tackle capabilities challenges such as algorithmic bias and data security [10].

The results may well speed the digitization of AI banking. It presents the important banking tasks that have space for improvement with AI technologies. Study findings demonstrate that chatbot assistance and guidance adoption is a priority. This study explores how artificial intelligence has

been adopted by the banking system with the use of new client experience in the enterprise of finance.

Literature Review

This in-depth analysis draws from previous studies conducted by scholars. Customer loyalty is perceived to be important to the survival and profitability of many types of service firms, particularly in the banking industry. [13]. Client satisfaction and service quality perceptions affect the clients' loyalty in retail banking. With a rapidly changing financial landscape, banking institutions need to comprehend the customer experience and assess customer journeys over time. Which ultimately leads to increased customer satisfaction and by extension service quality. This focus on customer experience has been driven by changes in modern customers whose interactions with companies take place over multiple media across multiple touchpoints, resulting in increasingly more complex customer journeys [14].

With the growth of technology, banks have begun digital transformation projects. Banks need to streamline back-office operations and processes to support this transformation. Similarly, client needs are prioritized and great practices in service are developed. Artificial intelligence and big data analytics have enabled the construction of data-driven solutions that improve the quality of customer service. Since then, there have been many features that can be customized, which have led to enhanced user engagement. The empirical study describes the practices of banking in the Indonesian and global banking sector that apply AI and big data analytics (BDA) technology. Data collection is done using interviews. Enterprise architecture is proposed as the only way to achieve that [15].

Based on the lens of three factors, System, Information, and Service, the empirical research investigates the inaugural customer experience with chatbots. Hypothesis testing is performed to find out whether perceived risk has an impact on the relationship between the three quality metrics and the customer experience. The findings facilitate banks in improving consumer and brand engagement with the use of chatbots with customer-centric abilities. Data is obtained from a survey [11].

A comprehensive theoretical perspective demonstrates how AI could improve creative customer engagement, help marketers sound out consumer expectations, and help companies adapt to the myriad services they offer to remain competitive. It also enables businesses to respond quickly to customer queries across different scenarios. The revolution of traditional banking processes using effective AI deployment is shown in this study. As three specific examples, the research was on Caixa Bank in Spain, Royal Bank of Scotland in Scotland, and Mastercard in the United States [12].

A theoretical analysis to explain the integration of artificial intelligence technology into the banking operations of commercial banks. By implementing AI, banks can reduce credit risk, improve the security of payments, make their compliance processes automatic, and improve the overall efficiency of the company. The paper examines AI characteristics that promote user embrace through adequate documentation, privacy protection, and transparency. Finally, it describes the methodological foundations of behavioral finance [16]. One specific study pays attention to the use of chatbot technology in education. However, it is sufficient to help guide front office chatbot interactions with students, and in turn guide what changes or requirements would

materially address customer experience. The primary method of data collection for this quantitative study was questionnaires administered to Indian higher education institutions. These are helping to improve the learner learning outcomes [17].

A systematic study produces a complete model using a combination of social media text and text-mining, classification algorithms and sentiment analysis to identify financial and/or service expectations of customers. It utilizes natural language processing (NLP) for K-clustering. global banks collect this information [18]. A different piece focuses on how artificial intelligence can be leveraged to facilitate customer engagement and accelerate banking processes. The findings offer banks and financial institutions an elaborate system that can improve their practices. We entail the theoretical analysis for multinational banks [19]. This urgency to adopt a more creative operating style within the Russian banking sector is illustrated in an essay, which looks at how different countries have integrated advanced AI technology into their banking sector. It provides approaches for attaining digital transformation from a banking perspective [20]. This shift is the key not only to better customer engagement but also to maintaining a competitive edge in a rapidly changing market. By employing the latest advancements in technology, banks can improve customer satisfaction, make processes more efficient and fuel expansion in a progressively digital economy.

The study will incorporate both academic literature and industry case studies to analyze how AI can be applied to different banking functions globally. It will determine the implications of AI in areas such as data transformation, financial management, automated customer service, and customized banking products. The research will evaluate the impact of diverse regulations on the use and effectiveness of AI in banking, helping to understand how banks can adapt and benefit from the rapid growth of technology in the AI domain.

Methods

Research Process Flow Chart:

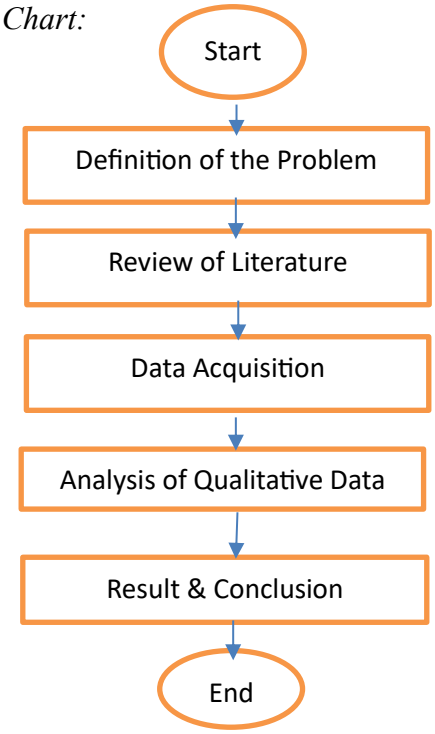

Fig. 2: Research Process Flow Chart

The research had four stages: (i) problem definition, (ii) literature evaluation, (iii) data collection, and (iv) qualitative data analysis, culminating in results and conclusions. Figure 2 delineates the research techniques utilized in this study.

Data Collection: This paper conducted qualitative research, employing an analysis of both primary and secondary data. Figure 4 displays the extensive data gathering utilized for the study.

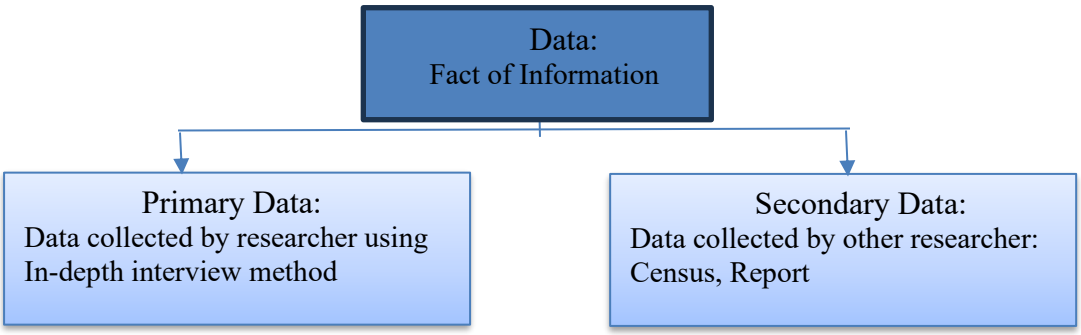

Fig 3. Data Analysis

We obtained primary data by conducting comprehensive interviews. The research participants are chief information officers, or heads of IT, from eight banking organizations. We chose in-depth interviews as the primary data-gathering strategy due to their capacity to thoroughly and comprehensively examine issues. In addition to our primary data discoveries, we also gather secondary data for verification. Secondary data refers to information gathered by others, scholars, or organizations. We examined secondary data to explore research enquiries regarding the use of AI and big data analytics in international banking. The data underwent Qualitative Data Analysis (QDA). Two individuals from distinct universities evaluated the preliminary version of the interview script to ascertain its validity. The pilot feedback clarified ambiguity and restructured areas that participants had previously considered confusing before the major interviews\

Table 1. Interview Questions.

Code	Question
Q1a	Has your organization adopted Artificial Intelligence (AI)?
Q1b	What features have been created as a result of implementing AI? Has your bank implemented Big Data Analytics?
Q2a	What features have been developed as a consequence of using Big Data Analytics?
Q2b	What challenges do you anticipate arising from the use of AI and Big Data analytics in your institution?
Q3	In your view, what obstacles may arise when your institution adopts AI and Big Data analytics?
Q4	Do you believe that implementing AI and Big Data Analytics can improve customer experience? Which application would be prioritized to enhance customer experience? Please explain.
Q5	Can you describe the IT architecture of your Digital Banking, particularly the integration of AI and Big Data Analytics?

We also collect important secondary data to complement the inferences made from our core data. Secondary data is data collected by other researchers or institutions. We analyzed secondary data to answer the research questions, e.g., the extent of AI and Big Data Analytics utilized across the global banking. Qualitative Data Analysis (QDA) was used to analyze the data.

Result and Discussion:

A. Using big data analytics and artificial intelligence in international banking

AI development impacts consumer lifespans alike in the current day as well as the upcoming decade. Artificial intelligence gadgets are becoming a common part of our daily lives. An ever-expanding piece of the economy that touches nearly every business and every consumer, the banking industry is being disrupted by artificial intelligence. AI use cases across various banks globally are illustrated in Table 2.

Table 2: Several international banks and their use of AI

Bank	Functional Area
Bank of America	A chatbot and AI-enabled technology that provides clients with financial advice through voice and text messaging.
JPMorgan Chase	Using mobile applications, businesses can simplify customer interactions and attract new clients, especially millennials.
Wells Fargo	Mobile applications for enhancing customer interactions and attracting new clients, particularly millennials.
City Bank	Fraud Detection
JPMorgan	Process Automation

Table 3. Implementation of Big Data Analytics in many global banks

Bank	Objective
HDFC Bank	Deliver more relevant content through the right channel.
OCBC Bank	Provide the right content on the right platform.
Bank of China	Deliver content through the most suitable channel.
GE Capital	Identify behaviors across multiple channels that result in sales. Enhance customer experience and improve marketing effectiveness.
HSBC	Direct customers towards more affordable channels.
PKO Bank	Evaluate the effectiveness of marketing campaigns across multiple channels using a multi-channel management tool.
Laurentian	Conduct marketing campaigns across various channels.
Bank of Canada	Run marketing campaigns across different channels.

B. Customer Experience and Expectations with Banking Chatbots

We conducted a study on customer expectations regarding the use of chatbots and virtual assistants in banking platforms. A total of 139 individuals completed the survey.

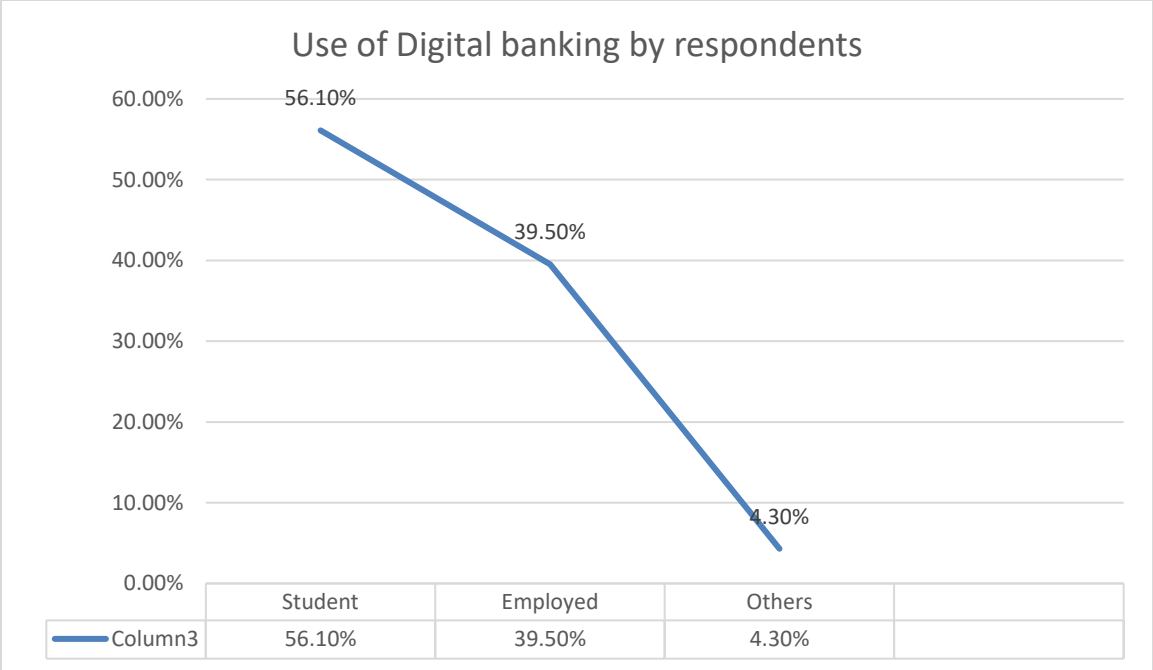

Fig. 3: Use of Digital banking by respondents

Fig. 3 comprehensively examines the utilization of digital banking across diverse demographic groupings. Students constitute the predominant user category with 56.10%, indicating a significant adoption rate among this demographic. Employed individuals constitute 39.50%, ranking second and suggesting substantial yet relatively lower usage than students. The minimal percentage of 4.30% in the "Others" category signifies this group's infrequent utilization of digital banking. The data indicates that students predominantly utilize digital banking, followed by employed individuals who engage with it considerably, while other demographics exhibit lesser usage. This demonstrates the varying adoption rates of digital banking among specific demographic groupings.

Applications predicated on Chatbot Support

- Customer service: Chatbots answer questions instantly for customers over SMS texts. It is also responsible for tracking customer feedback answers. The standard scope of questions pertains to account balances, statements, FAQs and similar topics.

- Loan Decisions: Chatbots that offer tailored information help borrowers make decisions faster. The chatbots can send some questions to the human agent when needed.

- Financial & Securities Transactions: Chatbots support customers in all financial matters, holding and managing their funds as well as managing their liabilities across multiple accounts. A customer is redirected to a payment page with pre-populated data.

- Bill Payment: Consumers can make payments for utility, rent, water and telecommunications, as well as other bills, through chatbots. One advantage is the ability to transfer funds between accounts.

- Through the chatbot's notifications on credit card and transaction patterns, the user is prompted to use their credit card to settle payments. They call upon past data like credit histories, transaction histories, and spending patterns.

C. Challenges & Opportunities

Banking organizations are starting to use artificial intelligence and big data analytics. These technologies are still in the exploration and experimentation phase of their integration into mainstream services. However, they are still assessing the opportunities and threats posed by the emergence of AI and BDA. They are currently deciding which solution best meets the client's requirements. The bank's head must ensure that the business will gain from this state-of-the-art technology, and the investment will yield a sizable return. Based on various interviews and qualitative data analysis, there were many challenges faced by the Indonesian banking industry in adopting artificial intelligence and big data.

a. Infrastructure constraints

Some of these include: Financial institutions need to upgrade their banking infrastructure.

b. Accurate Data

Ensuring data integrity is key for financial institutions to utilize AI and big data analytics technologies. With no accurate data in place, financial institutions run the risk of undermining the customer experience they are looking to improve.

c. Legacy, disconnected, not integrated technology

d. Regulatory constraints

b. Rigid corporate procedures and teams. Personnel who don't have the appropriate skill sets, g. The venture of BDA and AI can be costly.

In-depth interviews obtained from CIOs and IT executives in the banking sector show that the use of AI or Big Data Analytics helps improve the client experience. Upcoming AI and big data measures, with the potential to enhance user experience, will be put front and center. The customers sought more personalized care. High-net-worth individuals and clients need a bank which ensures responsible business practices with their cash, and which can grasp their financial interests and requirements. This kind of tailored interaction will distinguish it from traditional banks and fintech start-ups.

b. Making the optimal use of goods and services.

Banks can provide an attractive value proposition for their customers by enhancing their products and services.

c. Customer relationship management

Big data and artificial intelligence could be used to learn about client expectations, habits, and behaviors. Banks also have to cross-sell and upsell.

d. Channels offer pre-approved loans. Mobile applications and chatbots: These platforms offer pre-approved loans. For example, Fraud detection to identify rare transactions.

f. A faster response for the service request based on the service consumption pattern.

D. Proposed IT Infrastructure for Digital Banking

To make the operations effective as well as enhance customer satisfaction, the ideal IT infrastructure for digital banking attempts to uplift the efficiency, security as well and scalability. Cloud computing is critical for banks to handle huge amounts of financial data due to its scalable

processing and storage capabilities. Moreover, edge computing brings real-time data processing directly closer to the consumer, reducing latency that accelerates transactions and boosts service reliability. These technologies establish the underpinnings of a modern digital banking ecosystem. Although the strengths and traits of every bank are different but the following elements can give a bank a competitive edge for growth.

- **Cloud Infrastructure:** Due to the features and applications in modern banking, IT infrastructure has gained complexity and is expensive. FinTech firms, finance institutes, or any business can also opt for Public clouds, Private clouds or the hybrid models. These provide affordable storage and operational versatility.
- **On Premise:** The licensed solution opens the door to customization, additional integrations, and more features. Its customers control all aspects of safety, maintenance, and storage, including IT personnel and costs. This is an investment for the long term that will be expensive.
- **SAAS (Software as a Service):** It contains ready-made modules and it allows easy modification. All of the data is stored in a cloud server that is offered by a service provider. Monthly payments often cover security and maintenance services.
- **Big Data (Hadoop):** In particular, Hadoop has transformed banking by simplifying the storage, handling, and analysis of voluminous financial data. Hadoop's distributed computing platform supports both structured and unstructured data in large volumes, which is difficult for traditional banking systems to manage. Due to the fact that it analyzes transaction behavior and detects anomalies in seconds, this technology is a key component of risk assessment and fraud detection. Machine learning improves loan approvals, credit risk assessment and personalized financial services with predictive analytics. For example, Hadoop supports better consumer insights through the handling of unstructured data like emails and social media. Encryption, access control, and audit logging enhance security and compliance with regulatory processes such as Know Your Customer (KYC) and anti-money laundering (AML), among others. By increasing security, efficiency, and decision-making, Hadoop balances modern digital banking infrastructure.
- **OCR (Optical Character Recognition):** This is a method of transforming a scanned, handwritten, or printed text into a machine-readable format. This application is amazing at analyzing and digitizing banking records. AI and OCR expedite document processing and eliminate the need for human verification. This enhances user experience and reduces the startup time. OCR is used in banks to help them process checks more efficiently by extracting information like account numbers, amounts, and check numbers. Optical character recognition technology can extract MICR data from handwritten bank checks. Bhandari (2020). A Tesseract OCR is a free and open-source software package that is relatively easy to add to a Python environment.
- **Spacey Library:** This can be used if you have any job around natural language processing, and you have an open-source software library. It can be further supplemented with many statistical machine-learning models that are suitable for operations. It builds customer knowledge and drives organizational improvement through Document Processing, Text Mining, and Sentiment Analysis.

Conclusion

Integrating Artificial Intelligence (AI) and Big Data Analytics (BDA) in banking has radically altered the industry, improving operational efficiency and customer experience. This study

underscores the importance of AI in addressing modern banking challenges, such as fraud detection, process automation, and personalized client engagement. Banks can meet the growing need for seamless and customized banking experiences by using AI-driven technology such as chatbots, which improve service efficiency, save operational costs, and offer customized financial solutions.

Nevertheless, the implementation of AI and BDA faces obstacles. Banks encounter obstacles such as antiquated infrastructure, data accuracy challenges, regulatory limitations, and a deficiency of qualified personnel. Despite these challenges, the potential benefits of AI, such as immediate fraud detection, personalized financial advice, and improved customer relationship management significant. Banks that skillfully address these difficulties can gain a competitive advantage, enhance consumer satisfaction, and foster innovation in the digital banking sector.

The study establishes a comprehensive IT infrastructure for digital banking using cloud computing, edge computing, and advanced technologies such as Hadoop and Tesseract OCR. This infrastructure lets banks handle significant data volumes while maintaining security and providing real-time, tailored services. Banks can modernize operations, improve scalability, and optimize decision-making processes by implementing these technologies.

In conclusion, AI and BDA are not merely technological innovations but vital tactics for banks seeking to prosper in the digital age. Concentrating on user-centric innovations and addressing implementation issues will empower banks to fully leverage the benefits of AI, revolutionizing their operations and providing outstanding client experiences. This research enhances the discourse on digital banking transformation by offering pragmatic insights and recommendations for banks seeking to leverage AI in their quest for digital excellence.

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