

Artificial Intelligence in the Saudi Arabian Banking Sector: Role in Customer Satisfaction and Its Implementation Challenges

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Received: May 21, 2024

Accepted: July 9, 2024

Online Published: August 20, 2024

doi:10.5539/ijbm.v19n5p172

URL: <https://doi.org/10.5539/ijbm.v19n5p172>

Abstract

The study aimed to examine the impact of artificial intelligence on customer satisfaction and the challenges Saudi Arabian banks face in implementing this cross-cutting technology. The study used a survey design and collected responses from 100 participants, mainly bank customers and bank officials. The result revealed that artificial intelligence (AI) is positively and significantly correlated with customer satisfaction (CS). This suggests that customer satisfaction tends to rise in tandem with the application of AI in banking. The mediation analysis result showed that Ease of Use only mediates 9.82% of the relationship between AI and CS, and it is not statistically significant ($\beta=0.0607$ (95% CI: $-0.0246, .146$), $z=1.39$, $p=0.163$). The study provides practical insights for Saudi Arabian banks, highlighting the need to enhance the adoption of AI to promote customer satisfaction. It also outlines frameworks for minimizing challenges and barriers against the implementation of AI, including promoting data security and customer privacy.

Keywords: the banking sector, artificial intelligence, ease of use, Saudi Arabia, customer satisfaction

1. Introduction

The introduction section briefly summarizes the topic by analyzing what other studies have found. It helps show the research motivation and the study's rationale. It also emphasizes the study's importance and research questions.

1.1 Background

Maintaining market share and improving performance metrics is a challenge for banks worldwide. The management needs to consider that digitalization has increased the competition within the banking industry, which fintech companies and shadow banking institutions further intensify in most national markets (absent a few less developed economies, of course) to achieve this goal (Badea et al., 2021). Yet, consumers in most local markets have grown more discerning and demanding due to rising financial literacy, more accessible information access, and widespread Internet use, enabling customers to compare different banks' service offerings (Tiwari et al., 2021). However, El-Gohary et al. (2021) argue that banks cannot considerably differentiate their services, implying that customer satisfaction is critical and that bank management wants to know how to improve to retain clients.

This century has seen an upsurge in banks' use of artificial intelligence (AI) to personalize goods based on consumer demand. A computer or robot controlled by a computer is considered to have AI if it can accomplish activities that ordinarily need human intelligence and judgment. This artificial intelligence system seeks to replicate human intelligence and behavior. AI in business will transform problem-solving, automation, and customer service in the future (Dantsoho et al., 2021). According to Badea et al. (2021), artificial intelligence can streamline data administration activities, enhance credit ratings, and detect possibly fraudulent transactions.

Artificial intelligence has made it possible to offer banking services even to the underserved population that was ignored by contemporary banks (Badea et al., 2021). Because of this, people no longer need to present themselves physically at the bank, which promises to enjoy banking services, but this can be done in the comfort of their homes. Additionally, service-providing expectations shifted in the customer-bank relationship. Customers now want service bundles that address their financial service demands, unlike when this connection was often centered on only one service (Kochhar et al., 2019).

Saudi Arabia's banking sector has not been left behind, and it has used this technology to offer high-quality, adaptable delivery of financial services (Dantsoho et al., 2021). Several major Saudi banks have integrated an artificial intelligence chatbot service solution into their online banking platforms to improve client service in all areas, including lending, deposit-taking, investment banking, and asset management. Blockchain technology can potentially transform how banks manage data by reducing the need for human interaction (Ballestar et al., 2019). There are a lot of potential applications of AI in banking, which can result in numerous transformative changes and improvements.

Research into AI applications in the banking industry is underway. With the expansion of online and mobile payment options, credit card fraud has exploded in popularity, making it a leading cybercrime threat (Hariguna & Ruangkanjanases, 2024). Businesses have started using AI algorithms to check the authenticity of clients' credit card transactions in real-time. These algorithms compare the amount and location of the transaction to prior ones (Hu & Krishen, 2019; Hughes et al., 2019).

1.2 Problem Statement

Banks have been refining their customer service strategies for decades, and they have customized cutting-edge technology to suit the unique nature of their job. For instance, the first automated teller machines (ATMs) went live in the 1960s, and payment cards were available for use a decade later. The public's cognizance of online banking around the clock and mobile banking around 2010 increased with the arrival of the new millennium (Khatoon et al., 2020). The financial system is experiencing thrilling new frontiers due to the digital age's introduction of new opportunities, such as integrating artificial intelligence into banks and other financial institutions. Banks could save almost \$447 billion in 2023 by developing and implementing AI technologies (Polireddi, 2024). Despite universal agreement on the subject, there has been little research into the effects of artificial intelligence on the banking business. A few studies have sought to investigate the effects of AI on the banking business, but they have all focused on various sections of the world. No research on Saudi financial institutions has been conducted thus far. Al-Araj et al. (2022) investigated AI's potential to improve service quality and customer happiness in Jordan, while Dantsoho et al. (2021) examined the relationship between AI quality, customer preference, satisfaction, and intention to use AI-powered e-banking services continuously in Nigeria. Also, Bhattacharya and Sinha (2022) investigated the Indian banking business and how AI may be used to improve the client experience. As a result, the study will look into the relationship between AI adoption in banking and consumer happiness to address this knowledge gap.

1.3 Research Questions

- i. What is the relationship between AI and customer satisfaction levels in Saudi Arabian banks?
- ii. To what extent does perceived ease of use of AI technology mediate the relationship between AI usage and customer satisfaction levels in the Saudi Arabian banking sector?
- iii. What challenges do Saudi Arabian banks face in implementing AI systems?

1.4 Research Objectives

- i. To examine the relationship between AI and customer satisfaction levels in Saudi Arabian banks.
- ii. To examine the extent to which perceived ease of use of AI technology mediates the relationship between AI usage and customer satisfaction levels in the Saudi Arabian banking sector.
- iv. To examine Saudi Arabian banks' challenges in implementing AI systems.

1.5 Significance of the Study

After COVID-19 showed that digital solutions could help businesses navigate complicated events, the effect and use of AI in banking grew. Most banks have implemented AI solutions to offer personalized services, enhance fraud detection, and streamline processes. The Saudi Arabian environment has been the subject of few studies despite the widespread recognition of the significance of AI solutions in the banking sector. Also, some banks have not adopted AI solutions because of the lack of awareness that comes with such solutions. Therefore, the study aims to improve understanding of how implementing AI solutions can help improve customer satisfaction.

2. Literature Review

This section presents a literature overview of the growing adoption of artificial intelligence in the finance industry.

2.1 The Scope of AI Applications in the Banking Sector

Before acquiring funds, banks must meticulously evaluate the creditworthiness of customers requesting loans.

Banks leverage AI to credit score their clients and avoid unnecessary losses (Ghodselahe & Amirmadhi, 2011). Using this grading system, banks can tell which scores indicate a low probability of default and which ones indicate a high possibility of default. Equally, Al-Araj et al. (2022) state that one artificial intelligence technique for scenario classification is the decision tree approach, which is used to build regression and classification tree models. In terms of marketing and profit, this method outperforms other approaches to credit rating analysis, such as logistic regression and discriminant analysis. In the same way, getting a loan is very important. This aligns with Manser Payne et al. (2021), who notes that most customers and 65% of member organizations currently utilize mobile wallets. Online payment services are well-received by customers since they improve banking services by increasing revenue production and reducing the use of traditional card transactions. It uses AI to glean insights from readily available unstructured data to understand clients' needs and tailor their mobile banking products to meet these needs (Al-Araj et al., 2022). To keep and develop their customer base, bankers need to keep strong relationships with their clients. Banks must preserve a strong client connection to keep up with their clients' changing demands and expectations. Customer loyalty can be increased by offering economically priced, high-quality services. The banking industry is looking into the prospect of utilizing an artificial neural network trained for similar jobs in other sectors to predict customer loyalty. After gathering data, multiple regression is used to discover essential factors and prepare the data for modeling (Al-Araj et al., 2022). This prediction model uses a feedforward deep residual technique with an artificial neural network.

The emergence of current digital technology has resulted in more effective means of detecting fraud (16). Because of the massive amounts of data generated by electronic papers, contracts, emails, messages, and financial transactions, regulators require more sophisticated tools to identify fraud (Hassan et al., 2023). Artificial intelligence and machine learning are ideal for detecting fraud because of the vast amount of digital data available and the ease with which language and data can be assessed. Conversely, using AI in operational setups and strategic objectives might help administrators get more done in less time (Al-Araj et al., 2022). AI should not be seen as an independent technical toy but rather as an integral part of the organization's authority, as it affects their most essential tasks. Integrating it into the service's routine operations helps staff members grasp overarching concepts and choose how to apply them in their areas of expertise. Al-Araj et al. (2022) suggest that financial institutions could benefit from data applications such as Threat Match and Pattern Scout. These programs could improve network visibility and real-time monitoring of internal systems for network vulnerabilities. Software solutions like this may help banks find cybersecurity flaws in their networks, which might lead to a decrease in long-term security spending and the prevention of data breaches. The platforms may use machine learning to identify patterns in companies and assist with enterprise-wide security and operational tasks. Human security officers sometimes spent fifteen to sixty minutes on a single event since the banks relied on outdated technology (Pakurár et al., 2019; Soni, 2019). With the integration of cybersecurity technology, individuals could quickly evaluate the extent of an event and decide if it required escalation within one to five minutes.

2.2 Customer Satisfaction

Consumer satisfaction with a business's goods, services, and abilities drives growth. It's crucial to client loyalty and future purchases. Thus, future growth and revenue are more straightforward to anticipate. However, standardization in the banking business limits price competition, so one bank may outperform another based on customer satisfaction (Al-Araj et al., 2022). Two ways banks please clients may set them apart. Bank-customer connections heavily influence customer satisfaction. Customers want banks that understand them as individuals rather than just selling products. Modern banking allows users to communicate with banks via phone, ATM, internet, and mobile banking apps. Customer experience consistency across channels is a crucial discovery. Similarly, according to Tatikonda et al. (2022), these factors are critical for ensuring dependable and consistent deposit timings across all deposit methods and transmitting information quickly between channels. To provide a great experience, banks must exceed customers' expectations across all channels.

Consumer satisfaction indicates how successfully a company serves consumer demands (Al-Araj et al., 2022). Facilitating service quality evaluation is another component. Modern businesses that do not provide high-quality goods and services risk losing clients to competition. Customers may rate products and services by providing feedback. Due to increased quality expectations and more demanding customers, enterprises should prioritize client attention, value providing, relationship nurturing, and market innovation. Firms seldom track consumer expectations, satisfaction, or rival performance (Kishada et al., 2016). Similarly, Suhartanto et al. (2022) state that such clients demanded service improvements. Businesses are using AI to meet customers' growing needs. Similarly, Manser Payne et al. (2021) discuss the banking industry's influence on national growth. Bankers need to interact with customers to retain and build loyalty. Banks must maintain client relationships to fulfill clients'

evolving needs (Al-Araj et al., 2022). Providing affordable, high-quality services may also increase client loyalty. Banking may use artificial neural networks to forecast customer loyalty like other industries. Studies suggest factor analysis to discover critical factors from all variables after data gathering to prepare data for modeling. This approach predicts using an artificial neural network and feedforward backpropagation. The training dataset's classification creates K subsets in K-fold cross-validation (Al-Araj et al., 2022). The efficiency coefficient and root-mean-squared error may evaluate the approach after dataset assessment. The artificial neural network predicts consumer loyalty with high accuracy.

2.3 Leveraging AI in Saudi Arabia's Banking Sector

Twelve banks are part of Saudi Arabia's banking system. Among the banks in the Kingdom, the National Commercial Bank (NCB) has the highest balance sheet, with assets exceeding SAR 466.3 billion. It accounts for 20.5% of the overall market. Al Rajhi Bank comes in second, with an asset base of SAR 363.3 billion and a 16.0% market share (Al-Baity, 2023). The fast use of AI and analytics drives a dramatic revolution in Saudi Arabia's financial industry. According to Al-Baity (2023), these technologies are beyond mere accessories and are crucial in revolutionizing client experiences and improving operational efficiency. Personalized services, better fraud detection, and streamlined operations are just a few ways that banks and other financial institutions are using AI. This shift cannot occur without the cooperation of banks and financial technology companies. Innovative financial services and products are brought to market via the cooperation of such collaborations (Badghish & Soomro, 2024). Al-Baity (2023) states that the Kingdom's dedication to creating a favorable climate for FinTech innovation is seen via the execution of programs like the Makken Program, established by SAMA, and the sandbox framework. These initiatives allow financial technology companies to safely test cutting-edge artificial intelligence and analytics tools on consumer data.

There is more than just customer service that AI may improve in the banking industry. Risk assessment, compliance, and the creation of new financial products all rely on it heavily. The need to incorporate new technology into existing banking processes is becoming more acknowledged by Saudi Arabian financial institutions (Al-Baity, 2023). They will be positioned as pioneers in the digital transformation path, and their service offerings will be enhanced. In 2024, digitization, regulatory improvements, and an injection of international capital will drive the sustained expansion of the Saudi Arabian banking sector. The industry is expected to be a vital driver of the nation's economic diversification and growth in 2023 as it adapts to suit the evolving demands of consumers and enterprises. To succeed in this changing financial environment, customers and banks must be aware of these trends and open to new ideas.

2.4 Theoretical Framework and Hypotheses Development

The research framework has to enable the evaluation of specific correlations between AI adoption and consumer happiness to understand the paradigm shifts caused by the ever-increasing rate of technical development and AI deployment in the banking sector. The theoretical framework recognizes the need to examine a wide range of factors, such as the impact of AI applications, data privacy practices, and the integration of AI designs on customers, to contextualize the use of AI technologies to improve customer satisfaction in the Saudi banking industry. One of them is the contingency perspective, which emphasizes that within the range of factors related to AI implementation for customer satisfaction, the outcomes are moderated, and it also encompasses how customers perceive AI applications in the industry, such as fraud detection and recommendation systems' personalization. The assumptions of the research concern the connection between consumer satisfaction and the use of Artificial Intelligence (AI) in banking organizations. The study examines how AI can enhance customer satisfaction, where moderating factors are also considered (Rafique et al., 2020). Such moderating factors might help make a difference by either increasing or decreasing the impact of AI with regard to happiness. According to the literature, variables such as customer attitudes towards AI and technology awareness assist in using AI better (Ibrahim et al., 2017). However, when customer attitudes towards implementing AI are positive regarding the behavior that has been assessed and their general category characteristics associated with new technology acceptance, the integration of AI can add immense value to customer satisfaction (Davis, 1989). With this understanding, the theoretical framework brings out ideas on constructing customer perception in the research process. It encompasses the perceived usefulness of AI, individual uses, and its effect on the customers. The research aims to understand how the deployment of AI affects customer satisfaction in the Saudi banking industry via the lens of a unified theory of technology acceptance and application.

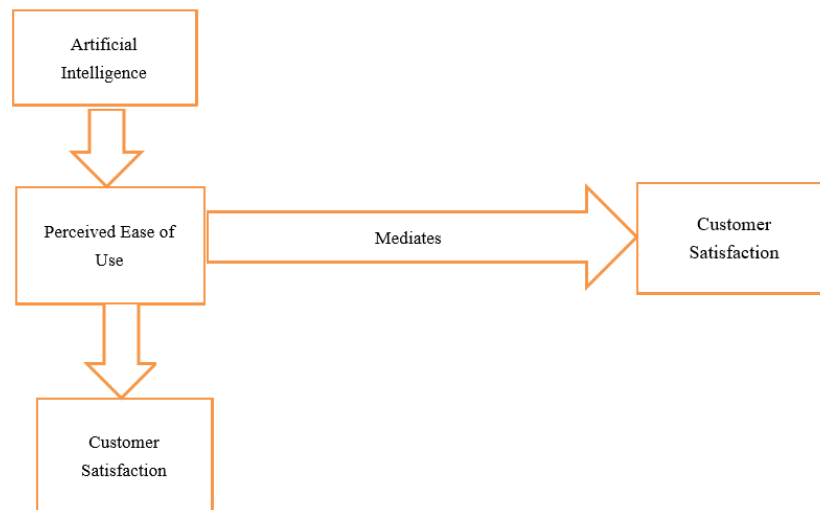


Figure 1. Conceptual model

In the context of the banking industry, the conceptual framework shows the relationship between AI, perceived ease of use, and customer satisfaction. The study examines the influence of perceived ease of use as a moderator that links directly and indirectly between artificial intelligence and consumer satisfaction. The independent variable is the use of artificial intelligence in financial organizations. The mediator element, perceived ease of use, is the degree to which customers consider the AI technology easy to use. The dependent variable is customer satisfaction, which captures consumers' satisfaction with banking services. The paradigm provides two ways in which AI could influence customer satisfaction: First, it is the direct impact through which it increases the perceived ease of use of the product, and second, it is an indirect impact where it increases the perceived ease of use of the product. This implies that AI can provide a direct increase in consumer satisfaction, and this effect can be further enhanced when customers perceive an AI technology to be easy to use.

In consideration of the theoretical significance of the investigation, the subsequent theories were devised:

H1: The use of AI in Saudi Arabian banks is directly related to customer satisfaction levels.

H2: Perceived ease of use of AI technology mediates the relationship between AI usage in Saudi Arabian banks and customer satisfaction.

3. Material Studied, Area Descriptions, Methods, and Techniques

3.1 Research Design

The investigation will implement a quantitative research methodology. Quantitative researchers gather numerical data and analyze it mathematically to find patterns, forecast outcomes, test ideas, and perform experiments (Sileyew, 2019). The quantitative method is efficient where data from several research participants is needed.

3.2 Research Strategy

A well-thought-out research plan may help understand research goals, questions, and data collection methods (Oliva, 2019). The study used a survey as its research strategy, which was selected due to its effectiveness in collecting data from a broad population sample. Time restrictions also allowed for rapid data collection without going overboard on expenses. The survey is incomplete. A significant flaw is that respondents are never impartial while answering questions.

3.3 Data Collection Method

Addressing research questions comprehensively calls for efficient data collection. To come up with reliable research questions, the study began by looking through various academic databases, such as PubsOnLine, Google Scholar, ISI Web of Knowledge/ISI Web of Science, and subject-specific databases, such as ACM Digital Library.

3.3.1 Data Collection Instrument: Survey

The study's primary goal is to evaluate whether there is a link between the employment of artificial intelligence in Saudi Arabian banks and customer satisfaction. The researchers in the study collected their data through

surveys (Stockemer et al., 2019). Prior studies on the subject were considered during the creation of the survey. The first of the three components constituting the questionnaire was a cover letter delineating the study's objectives. The objective of the cover letter was to provide a comprehensive overview of the study's objectives and to reassure the recipients that their responses would be kept confidential. The second half of the study comprised quantitative inquiries regarding the independent and dependent variables. The five-point scales employed to designate the variables are as follows: strongly agree = 5, agree = 4, neutral = 3, disagree = 2, and severely disagree = 1. Using Likert questions, research participants may easily express their opinions on specific topics by giving yes or no responses (Bell et al., 2022). The "Neutral" option allowed participants to answer questions they were unsure about.

Google Forms was used to gather data for the research due to its user-friendliness. The researcher had to do pilot testing before distributing the survey and beginning data gathering. Bell et al. (2022) agree that pilot testing is an excellent way to validate the idea and quantification of the questions. Before data collection, pilot testing is necessary for survey mistake correction (Bell et al., 2022). A pilot test was conducted by administering the survey to a convenience sample of friends, family, and classmates. Their suggestions helped to clarify the key issues (Bell et al., 2022). The expert's recommendation on the improvements that needed to be made immediately was included in the research. The research relies on social media sites to communicate the poll to a large audience because of their vast use. X, previously known as Twitter, Instagram, WhatsApp, LinkedIn, and Snapchat, was one of several social networking services used. Every study participant received a letter detailing the research's goal and what to expect from the survey. The survey was prepared in Arabic and English language.

3.3.2 Sampling

The present study was interested in getting insights from bank employees, especially financial managers, and clients in Saudi Arabia, making purposive sampling the suitable method. Purposive sampling was chosen because it ensured that participants had a more profound knowledge of how AI can influence the satisfaction of financial customers. The survey was distributed to 140 people, and 100 responded, representing a 71.43% response rate.

3.3.3 Operationalization and Measuring of Variables

Andrade (2021) states that operationalization turns ethereal concepts into quantitative facts. Data on these notions can be easily gathered thanks to operationalization. The study's dependent variable is customer satisfaction (CS), whereas the independent variable is Artificial Intelligence (AI). The mediating variable in the study is perceived Ease of Use (EOU). The independent variable artificial intelligence explains the adoption of technologies such as machine learning in the banking sectors with crucial indicators, including investment in AI, AI-enabled services, and system quality. The measurements for AI as an independent variable in the study will focus on financial reports and data logs revealing trends in usage and surveys that seek to establish customer perception of AI implementation in the banking sector. The dependent variable, customer satisfaction, focuses on attitudes, experiences, and contentment in using AI-enabled services in the banking industry, with key indicators ranging from loyalty, satisfaction, and positive perception. Primary sources of measurement include customer surveys and analysis of feedback from reviews and comments.

3.4 *Quality Criteria*

3.4.1 Validity

For a study to be considered valid, the research strategy and methods need to be robust and widely recognized worldwide. A study's validity depends on how well-organized and error-free its data and results are and how reliable the instruments employed to gather them are (Chander, 2018). When the validity is kept within reasonable bounds, it promotes broader acceptability and results in advancements in research.

3.4.2 Reliability

To assess the reliability of a research, Sürücü and Maslakçı (2020) state that one should consider the ideas' consistency and the study's repeatability. There are two types of reliability: internal reliability and external reliability. Internal dependability refers to how many survey questions (or "items") evaluate the same topic. External reliability refers to how well a metric is used in different contexts (Chander, 2018).

Table 1. Cronbach's Alpha measure for each variable.

Computed variables	Cronbach's Alpha	Number of Items
Artificial Intelligence (AI)	0.857	5
Customer Satisfaction (CS)	0.787	5
Ease of Use (EOU)	0.748	6

Source: Authors' analysis, 2024.

Cronbach's Alpha is displayed, showing the internal consistency reliability of the three research variables as follows. The total pieces for each variable are also shown. Cronbach's Alpha is one of the most widely used measures to evaluate internal consistency reliability. The extent to which one element on a scale is like another in size or degree. As Cronbach's Alpha progresses, internal consistency is more reliable. In general, research often adopts what can be deemed standardized values of 0.7 or higher. In this table, Cronbach's Alpha values are roughly greater than 0.7, meaning that the measurements used in the study have a high level of internal consistency reliability. In other words, all the components that make up each variable all mean the same thing.

3.5 Data Analysis

For the data to be correctly evaluated and understood and for conclusions to be drawn, systematic data analysis has to be used (Sileyew, 2019). Coding the raw materials was the first step in integrating the collected data into the SPSS statistical tool (Malhotra, 2010). The results were required to be numerically categorized by survey questions that included options such as "strongly disagree," "disagree," "neutral," "agree," and "strongly agree" (Sileyew, 2019). Data was coded and cleaned on an Excel database. However, all analyses were done using the SPSS program.

Descriptive statistics were run to find out how representative they were. Among other things, this revealed how gender, age, career, and level of education were represented in the data. The researchers used correlation analysis to determine the relationship between the two variables. According to Shrestha (2020), a correlation coefficient of 0.2 to 0.9 suggests a moderately significant link. Associations with values over 0.9 are considered vital, and those below 0.2 are considered weak. Since precise measurements are less prone to random mistakes and unexpected volatility, we tested the idea through reliability to ensure it was trustworthy. There was an administration of Cronbach's alpha, a reliability test. The regression equation and coefficient of multiple determination were generated using multiple regression analysis, which uses two or more independent variables (Klein, 2024). A linear connection exists when the changes in both variables are proportional (Klein, 2024). A linear regression study demonstrates the consistency between two variables when one variable is changed.

4. Results

4.1 Descriptive Statistics

Table 2. Descriptive statistics

Demographic	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Age				
18-25 Years Old	20	20	20	20
26-35 Years Old	34	34	34	54
36-45 Years Old	17	17	17	71
46-55 Years Old	16	16	16	87
Over 55 Years Old	13	13	13	100
Gender				
Female	46	46	46	46
Male	54	54	54	100
Level of Education				
Bachelor's Degree	37	37	37	37
Doctorate	19	19	19	56
High School	9	9	9	65
Master's Degree	35	35	35	100
Level of Income				

Less than SAR 50,000	8	8	8	8
SAR 50,000 - SAR 100,000	22	22	22	30
SAR 100,001 - SAR 150,000	34	34	34	64
SAR 150,001 - SAR 200,000	27	27	27	91
Over SAR 200,000	9	9	9	100
Occupation				
Bank Official	40	40	40	40
Customer	60	60	60	100

Out of 100 people who completed the survey, 54 percent were female and 46 percent were male. Participants were divided into three age groups: 26 to 35 (34%), 18 to 25 (20%), and 36 to 45 (17%). Those aged 46 to 55 came third, at 16%, and those over 55 came last, at 13%. The research population is organized according to their level of education. It is evident that most of the study participants had bachelor's degrees at 37%, followed by those with master's degrees at 35%, and those with a doctorate came third at 17%, with only 9% indicating that they only attained high school level of education. The table proceeds to demonstrate the distribution in terms of income category. Most study participants (34%) earned between SAR 100,001 - SAR 150,000, followed by those earning between SAR 150,001 - SAR 200,000 at 27%, and those earning between SAR 50,000 - SAR 100,000. Only 9% of the study participants had an income of over SAR 200,000, and 8% indicated their income was less than SAR 50,000. Because the survey was conducted among bank and customer officials, this table shows that 60% of the research participants were bank customers, and the remaining were bank officials.

The demographic clearly shows that the research participants were representative enough, and this comes with several advantages. Research results are more likely to indicate the target population's traits, habits, and attitudes when they are based on a statistically valid sample. The findings cannot be applied to the whole population if the sample is biased or skewed. Secondly, a representative sample improves validity and reliability. A well-representative sample minimizes biases and is more likely to be consistent. Additionally, if the sample is representative, we may say that the study's results apply to the population as a whole. This is of utmost importance when concluding, formulating policies, or implementing plans that impact many persons or organizations.

4.2 Regression Analysis

4.2.1 Multiple Regression

The study used multiple regression to help researchers better understand the relationships between the following variables: intelligence, user-friendliness, and customer happiness. Multiple regression helps determine how each aspect affects customer satisfaction and their importance. Multiple regression can be used to determine how well the model fits the data and how much variance in customer satisfaction is explained by the independent variables taken together. The regression result shows that Artificial Intelligence and Ease of Use control 63.9% variation in the dependent variable (customer satisfaction). The model p-value is 0.00, showing that the relationship.

The result revealed that artificial intelligence (AI) is positively and significantly correlated with customer satisfaction (CS), Pearson's $r=0.799$, $p\leq 0.001$. A very favorable association between AI and CS is shown by the positive correlation value of 0.799. This suggests that customer happiness tends to rise in tandem with the application of AI in banking. The mediation analysis result showed that Ease of Use only mediates 9.82% of the relationship between AI and CS, and it is not statistically significant ($\beta=0.0607$ (95% CI: -.0246, .146), $z=1.39$, $p=0.163$, which is greater than the significance level of 0.001. Therefore, ensuring that AI solutions are implemented in banking products is essential for banks to realize high customer satisfaction. However, it does not serve as a go-between for connecting AI and satisfied customers. Some of the challenges that Saudi Arabian banks face include regulatory hurdles, high cost of implementation, and challenges of ensuring unethical use of AI systems.

5. Discussion

According to the study, implementing AI technologies improves efficiency and service customization, resulting in higher customer happiness. It demonstrates how technological paradigm shifts continue to revolutionize Saudi's banking sector, an aspect supported by El-Gohary et al. (2021) findings indicating faster response times due to AI improving customer levels. Fundamentally, the assessment of the study's findings supports Dantsoho et al.'s (2021) analysis of the perceived roles of AI implementation in process efficiency and increasing impact on customer satisfaction in the banking sector. Tiwari et al. (2021) established that effective frameworks are

essential to adopting and implementing AI in delivering services. The study has lent its backing as stated earlier. The data also point to consumers thinking it is easier to use AI interfaces because of the AI technologies. As well as what Dantsoho et al. (2021) found, this supports the significance of perceived ease of use as a mediator to enhance customer satisfaction. Dantsoho et al. (2021) have revealed a positive impact of AI on banking customer satisfaction, while Ballestar et al. (2019) are worried about the worse consequence due to differential technological literacy. Lack of technological literacy among target customer groups hampers the positivity of artificial intelligence implementation in relation to satisfaction. Hariguna and Ruangkanjanases (2024) further provide disagreeing arguments around AI and perceived ease of use, indicating how complexities associated with technologies can present challenges to how customers access banking services. A comparative analysis of findings in the current study underscores that aspects such as culture and religion, context, and technological maturity can undermine how AI implementation impacts customer satisfaction.

5.1 Customer Satisfaction

A company's success relies on consumer happiness with its products, services, and staff. It strongly predicts customer loyalty and repeat purchases. Thus, revenue and growth forecasting is easier. Banking is highly standardized, limiting pricing competition. However, consumer happiness determines which bank thrives while another fails (Al-Araj et al., 2022). To satisfy their customers' banks, banks need to offer reliable services. Modern bank customers may engage with their banks online via a mobile banking app, ATM, or phone. Consistency across channels is a significant finding for customers. Both consistent deposit timings, irrespective of deposit mode, and quick information transmission across channels have to be carefully examined (Tatikonda et al., 2022). Banks have to satisfy customers across all channels to provide a great experience.

Al-Araj et al. (2022) also define customer satisfaction as a company's capacity to meet consumer needs. Additionally, it aids in service quality assessment. Today's businesses risk losing customers to competitors offering superior products and services. Customers may evaluate items and services by rating quality. Due to increasingly demanding consumers and more significant quality requirements, companies should focus on customer service, value generation, connection building, and market innovation. Companies seldom track competitor performance, consumer satisfaction, and expectations (Kishada et al., 2016). Suhartanto et al. (2022) answered these customers' requests for enhanced service. To satisfy client expectations, several organizations are utilizing AI. According to the paper (Manser Payne et al., 2021), the banking sector drives national development. The quality of banker-customer interactions determines client retention and acquisition. Client-bank relationships are essential for banks to meet customers' changing demands and expectations (Al-Araj et al., 2022). Customer loyalty may be enhanced by offering affordable, high-quality services. Banks may use artificial neural networks to predict consumer loyalty like other sectors. Factor analysis should be used to extract critical variables from all data. This will boost data modeling readiness. This prediction approach is built around a neural network and feedforward backpropagation. According to Al-Araj et al. (2022), K-fold cross-validation generates K classification subgroups from the training dataset. The efficiency coefficient and root-mean-squared error show how well the approach performed on the dataset. Using an artificial neural network to predict client loyalty may be a good idea.

5.2 Benefits and Limitations

Artificial intelligence might transform banking by simplifying procedures, saving costs, and enhancing customer experience. However, additional dangers and downsides need to be weighed. The banking business benefits greatly from artificial intelligence's ability to comb through massive data to pursue insights that people may miss. Use this data to train ML systems to forecast. AI also excels at repetitive work automation (Ramamurty et al., 2021). Chatbots and robo-advisors can handle customer service questions while humans focus on higher-order activities. Artificial intelligence can quickly evaluate enormous volumes of data, which may help risk management and fraud detection. After discovering detrimental behaviors, financial organizations are less likely to lose money or reputation. Ghandour (2021) also suggests that AI may enhance user experience. Personalization of chatbot and virtual assistant suggestions may boost client happiness and loyalty. Remember these considerations before using AI on your financial institution's data. The first happens when algorithms are trained to draw biased conclusions from incomplete or incorrect data. Fortunately, data collecting may help funding organizations prevent this. Data storage has to be protected from cyberattacks to avoid data breaches and protect user privacy (Sharma, 2023). However, AI research demonstrates that it can tackle issues in previously unthinkable ways.

5.3 Challenges

The KSA banking industry is making AI progress, but several obstacles remain. Saudi banks and other financial

institutions struggle to find AI experts. Ghandour (2021) claims that a lack of AI professionals in KSA's banking industry hinders AI development and implementation. AI experts are in high demand in healthcare and energy, worsening this shortage. Hasan et al. (2020) discussed how big data analytics may avoid public finance fraud, manage resources, reduce risks, and increase efficiency and effectiveness. According to their results, supporting this technology may help authorities. They found specific barriers, such as limited resources and expertise, that prevent large public finance data initiatives from succeeding. Additionally, Saudi financial institutions struggle with the high cost of AI. Few firms, particularly those with lower budgets, can afford AI software, hardware, and infrastructure (Subudhi, 2019). Updating and maintaining AI systems may be costly. AI technology in financial institutions causes data availability and quality issues. Financial firms struggle to get high-quality data due to data fragmentation, silos, and lack of standards (Subudhi, 2019). Algorithm training and development need high-quality data. These organizations may also require regulations to ensure ethical AI usage in banking. Confusion about standards and rules hinders acceptance and implementation (Subudhi, 2019).

5.4 Ethical and Regulatory Considerations

AI might change Saudi banking by improving efficiency and customer service. AI raises ethical and legal problems about privacy, security, prejudice, and responsibility. Consider numerous ethical challenges relating to AI's financial uses. Ahmadi (2024) states that an AI system's accuracy relies on the neutrality of its training data; biased data will skew the algorithm's outputs. Financial activities like loans or investments might cause discrimination. AI's impact on employment is another ethical issue. Humans replacing machines in customer service and data analysis has worried IT professionals (Krijger, 2023). Businesses should examine ways to offset these changes' economic impacts, especially for impacted workers, according to Abakare and Jeko (2024). Customers' data should also be protected. AI models need to safely store vast volumes of sensitive financial data by data privacy laws to perform correctly. Hacking an AI model might lead to financial fraud. Thus, financial organizations should consider AI ethics before utilizing it. Organizations may use AI to benefit everyone by eliminating prejudice, recognizing employee interests, and respecting data protection laws. Financial organizations should also incorporate all consumer groups in their data to avoid biased algorithmic decision-making (Abakare & Jeko, 2024). Finally, companies have to safeguard client data (Ahmadi, 2024).

5.5 Regulatory Considerations

According to Al-Baity (2023), financial organizations that use AI technology have to comply with data protection legislation such as the General Data Protection Regulation (GDPR) and the Saudi Data Protection Law. Consumers need to give consent before their data is used for AI. Everyone needs to accept responsibility. Al-Baity (2023) believes financial institutions should be responsible for AI system decisions. Injured clients should receive assistance in collecting compensation. Mishra and Sant (2021) explain why financial investment services employ AI. Banks have to handle customer data carefully and follow local and international data protection rules (Mishra & Sant, 2021). They may harness artificial intelligence's disruptive potential in banking while safeguarding client data and following ethical standards.

5.6 Ease of Use

While ensuring everything is easy to use is crucial, the findings show that banks should utilize AI for more than just making things more straightforward; they should use AI to boost customer satisfaction directly. To further understand the connection between AI and banking customers' happiness, future studies may look at other possible moderators or mediators (Alqasa, 2023). Furthermore, qualitative research has the potential to reveal how consumers see and anticipate AI-powered financial services, which might aid in determining what factors, outside usability, are most important in determining customer happiness.

6. Conclusion

To meet and exceed client expectations and ensure their pleasure, disruptive technology such as artificial intelligence is becoming more critical in the banking business. There are numerous AI applications in online banking, including chatbots, facial recognition, biometric identity, cyber security detection, and machine learning for fraud detection. Digital banking enabled by artificial intelligence is still in its early phases of acceptability, despite its efficiency in data interpretation and the capacity to address complicated issues and consumer concerns. Thus, the study aims to investigate how artificial intelligence has affected the pleasure of Saudi banking customers. There are many hurdles that Saudi Arabian banks have to overcome before they can fully adopt artificial intelligence (AI), although if this technology is adopted, it has the potential to enhance the client experience of banking services. It is necessary to eliminate legal limitations, control high implementation costs, and avoid immoral activities involving AI, which are referred to as challenges. Technology is now more paramount in current organizations, especially in terms of sustainability and production. The same pattern can be

observed in the finance business, where AI can enhance customer relations, among other factors. Facial recognition, as well as other AI technologies applied to security, contribute to minimizing dangers. Additionally, with the help of machine learning algorithms, financial services can be personalized; hence, we have cheerful customers. Lastly, AI can contribute to long-term customer satisfaction by enhancing the identification of clients' needs and satisfaction. Customer satisfaction can also be enhanced since overall productivity is enhanced through AI to reduce procedural time and eliminate delays. It is important to note that developing AI systems entails substantial costs. These costs may drastically offset the attitudinal improvement in the long run if they are ultimately shifted to consumers. Implementing AI might be a viable shift to improving customer experience in the Saudi banking sector. However, while benefitting from this tactic, one has to remember its shortcomings.

6.1 Recommendations

Several crucial barriers have to be addressed before Saudi institutions can potentially unlock the full potential of AI. Client information privacy and security are considered to be of paramount importance. AI systems are particularly easy to penetrate because of the massive amount of customer data used by the systems. Data protection should remain a major concern for banks, and there are few areas that should be of more significance than secure encryption and cybersecurity training for the workers. There also should be measures put in place in the form of legislation that seeks to regulate the use of AI in banking. There are three important questions that these systems should be built to answer: Data ownership, transparency, and accountability. To make the decisions of AI more accurate, trustworthy, reliable, and dependable, regulatory supervision is necessary for the rightful use of AI. Customers' Personal information should always be safeguarded regardless of the ability of AI to enhance the process and security. Privacy and security need to be addressed regarding AI in Saudi banks, along with proper legislation to promote the proper usage of AI.

7. Acknowledgements

The authors would like to express their gratitude to all the people who contributed to the study. All people, including Saudi bank executives, survey respondents, and the entire community working in these organizations, deserve appreciation for their hard work. The authors thank the university faculty members for their valuable scholarly input and guidance during the study. Further, the authors would like to thank those who contributed to the study's pilot test. This entails friends, families, and classmates who contribute to shaping the study tool that was developed. Additionally, we wish to acknowledge the sources of funding for the study. In addition, the last form of acknowledgment goes to the academic database, which provides information for the research. These databases include PubsOnLine, Google Scholar, ISI Web of Knowledge/ISI Web of Science, and the ACM Digital Library.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Canadian Center of Science and Education.

The journal and publisher adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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