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The Role Of Artificial Intelligence In Improving The Quality Of Banking Services In Yemeni Banks

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Abstract:

This study investigates the role of artificial intelligence (AI) on enhancing service quality within the Yemeni banking sector. Employing a descriptive-analytical methodology, the research systematically examines data collected from a sample of employees across seven Yemeni commercial banks. Utilizing advanced statistical analysis, the findings demonstrate a statistically significant positive influence of AI on banking service quality, with a measured effect size of ($\beta = 0.599$). Furthermore, the implementation of cybersecurity ($\beta = 0.646$) and AI-driven smart interfaces ($\beta = 0.569$) was found to exert a substantial and statistically significant effect on service quality improvement. The study also highlights a pronounced sector-wide shift toward AI adoption, propelled by increasing digital literacy among customers and ongoing advancements in AI-compatible infrastructure. These results underscore the transformative potential of AI technologies in optimizing operational efficiency and service delivery within financial markets.

Keywords: Artificial Intelligence, Quality of Banking Services, Cybersecurity Smart interfaces.

Introduction:

Technological advancement stands as a pivotal driver in societal and economic transformation. Within the banking sector, this evolution has been particularly pronounced, with financial institutions increasingly leveraging cutting-edge technologies—most notably artificial intelligence (AI)—to enhance operational capabilities and meet escalating consumer demands for personalized, efficient, and secure services. AI-powered systems have demonstrated exceptional proficiency in automating routine banking operations, including balance inquiries, transaction processing, and fund transfers, thereby enabling human resources to allocate greater attention to complex customer needs and value-added services.

Despite these advancements, critical challenges persist, particularly concerning customer comprehension of AI-driven systems and the imperative to ensure equitable, unbiased algorithmic decision-making. Furthermore, the rapid digitization of banking operations has amplified exposure to cybersecurity threats, rendering financial institutions vulnerable to breaches of sensitive data and electronic assets whether from internal or external threat actors. These risks underscore the necessity of robust cybersecurity frameworks and intuitive smart interfaces to safeguard institutional integrity while optimizing service quality.

The present study seeks to empirically examine the role of AI in elevating banking service quality within the Yemeni financial sector, with particular emphasis on two key dimensions: cybersecurity and AI-enabled smart interfaces. Specifically, it investigates the causal relationship between AI technologies (independent variable) and service quality (dependent variable). Structured systematically, this research comprises four principal segments: (1) methodological framework, (2) theoretical underpinnings, (3) empirical analysis, and (4) synthesized conclusions with actionable policy recommendations. By addressing these dimensions, the study aims to contribute actionable insights to the discourse on technological integration in emerging financial ecosystems.

Literature Review:

1. (Alababneh, 2022):

The study aimed to prepare a list of indicators which describing the performance of artificial intelligence technologies in the activities and accounts of large companies based on a sample of Credit Agricole Bank in the banking sector. The study also

compared performance indicators using artificial intelligence and their role, such as the duration of customer requests, the cost of customer service, and the number of requests processed by bank operators and managers. The study concluded that the practical advantages of using artificial intelligence include saving working time, financial resources and increasing the productivity of bank employees.

2. (Khadem, Haider Fadhel, 2025):

The study aimed to determine the impact of artificial intelligence dimensions on improving the quality of service provided in a sample of Iraqi banks in public and private sectors, and to know which sectors are most influential in improving the quality of services provided to their customers for random sample of employees and customers. The study concluded that artificial intelligence contributes to improving the quality of banking services.

3. (Abu Al-Khair, Mai Mahmoud Hamza, and Al-Sayegh Shahd Tariq, 2024):

The study aimed to identify the impact of artificial intelligence (AI) dimensions (expert systems, automatic machine learning, ease to use) on institutional performance in its dimensions (efficiency and effectiveness) through intellectual capital in banks at Saudi Arabia. The study concluded that AI has an impact on institutional performance and on intellectual capital.

4. (Al-Habishi, Muhammad Ghazi Suleiman, 2024):

The study aimed to identify the role of digitization and artificial intelligence applications in Islamic banks, as technology is one of the most important components of the contemporary business environment. The study concluded that the application of artificial intelligence in many fields of banking services has helped to develop bank performance by improving the quality of banking service

5. (Akram, Taibi, and Amina Moulay, 2023):

The study aimed to understand the role of artificial intelligence in the banking sector. The study concluded that there is a significant impact of artificial intelligence on the quality of banking services.

6. (Marzouq, Abdel Aziz Ali, et al., 2024):

The study aimed to identify the role of artificial intelligence in improving the quality of digital services provided by Egyptian commercial banks in light of technological developments and the world is transforming into a digital world at all sectors, particularly the banking sector. The study found a direct correlation

between the dimensions of artificial intelligence and the quality of digital services in banks.

7. (Al-Abd Al-Lat, Abdel Fattah, 2020):

The study aimed to identify the impact of applying artificial intelligence to achieving a competitive advantage and to examine the reality of its application in Jordanian banks. The study concluded that banks' expansion in artificial intelligence applications contributes to achieving a competitive advantage by reducing the cost of banking services, enhancing their quality, and increasing banks' market share.

8. (Abdul Aziz, Mahmoudi, et al., 2025)

The study aimed to identify artificial intelligence applications and their contribution to improving electronic banking services in Algeria. The study concluded that artificial intelligence can provide innovative services to customers.

What Distinguishes of this study?

The current study can be distinguished from previous studies and research in the following ways:

- To the researchers' knowledge, it is the first study on Yemeni situation during the specified period which, researchers', existing the role of artificial intelligence in improving the quality of banking services.
- This study represented by various studies existing artificial intelligence topics. It will be applied to the Yemeni environment, and there are no previous studies in this field.
- This study is a new addition to Yemeni and Arab libraries due to the novelty of its objectives and results.

Problem Statement:

The global banking sector is experiencing a paradigm shift driven by rapid technological advancements, with artificial intelligence (AI) emerging as a critical enabler of enhanced banking service quality. While empirical evidence demonstrates AI's transformative potential in optimizing operational efficiency, strengthening fraud detection mechanisms, and delivering personalized customer experiences, Yemeni financial institutions encounter systemic barriers to technological adoption. These barriers primarily stem from three interrelated factors: inadequate technological infrastructure, constrained economic conditions, and acute shortages of skilled human capital. Emerging scholarship suggests that

strategic implementation of AI-driven solutions could potentially mitigate these challenges, offering Yemeni banks a viable pathway to operational excellence and competitive differentiation within an increasingly digitized financial landscape. Of particular significance is AI's catalytic role in service quality enhancement, which directly influences customer satisfaction metrics and engagement levels, ultimately driving institutional performance improvements.

This study seeks to address a critical research gap by systematically examining the relationship between AI adoption and service quality enhancement in Yemen's banking sector, while concurrently identifying implementation barriers and proposing evidence-based solutions. The central research question guiding this investigation is: [Insert precise, academically formulated research question here]

How can AI contribute to improving the quality of banking services in Yemeni banks?

The following sub-questions arise from this:

- Does cybersecurity play a role in improving the quality of banking services?
- Does smart interfaces play a role in improving the quality of banking services?
- What is the reality of artificial intelligence in Yemeni banks?

Study Hypotheses:

Based on the study's problem and its sub-questions, the following hypotheses were formulated to answer the study's problem:

Main Hypothesis:

Artificial intelligence (AI) represented by (cybersecurity, smart interfaces) does not have a statistically significant role in improving the quality of banking services in Yemeni banks.

The following hypotheses branch out from the first main hypothesis:

- There is no statistically significant role for Cybersecurity in improving the quality of banking services
- There is no statistically significant role for smart interfaces in improving the quality of banking services

Study Objectives:

The study objectives can be defined in the following main objective, from which sub-objectives branch out as follows:

Main Objective:

To identify the role of artificial intelligence (AI) in improving the quality of banking services in Yemeni banks.

Sub-objectives:

- To highlight the importance of AI in developing banking services.
- To identify the most prominent applications of AI in the banking sector.
- To diagnose the technical and regulatory challenges hindering the adoption of AI in Yemeni banks.
- To understand the concept of banking services, their importance, and characteristics.
- To propose policies and recommendations to promote the adoption of AI in Yemeni banks.

Significance of the Study:

The importance of the study represented by the importance of its variables: (artificial intelligence, quality of banking services). These variables are considering the most important modern concepts in management science. These concepts require further research, and analysis in the banking sector. Linking these variables plays a pivotal role in constructing a banking work environment that keeps pace with developments and changes. The importance of the study can be formulated as follows:

Theoretical Importance:

- The study contributes to enriching the literature related to artificial intelligence applications in the banking sector, especially in light of the scarcity of studies focusing on Yemen.
- The study seeks to enhance and realize the potential of artificial intelligence in developing and providing appropriate and adaptive banking services.
- The study aims to identify artificial intelligence and its relationship to the quality of banking services.

Practical Importance:

- Improving banking services through artificial intelligence can enhance financial inclusion and attract investment in the Yemeni banking sector.
- Providing a vision for Yemeni banks on how to use artificial intelligence to improve banking services, such as fraud detection and others.

Study Terminologies:

Artificial Intelligence (AI): is a multidisciplinary field within computer science. It aims to create machines capable of simulating human mental abilities and focuses on the design, development of systems and software can of performing tasks that typically require human intelligence.

Smart Interfaces: interactive systems or platforms used to facilitate communication between users and modern technologies such as artificial intelligence (AI), the Internet of Things (IoT), and big data. These interfaces rely on smart technologies to make interactions more natural and efficient, whether through voice commands, facial recognition, gestures, or even sentiment analysis.

Cybersecurity: Refers to the protection of electronic systems and networks from cyber threats such as hacking, cyberattacks, and malware. Cybersecurity is considered vital in our current era, as technology and the internet are increasingly used in our daily lives (Dahmani, 2023).

Quality of banking services: The quality of banking services is having strategic value, and studying it helps the bank retain and satisfy its customers and employees, as well as increasing opportunities to provide banking services, attract new customers, develop relationships, enhance reputation, and improve banking performance according to customer expectations. Based on this, issues related to service quality have received great attention from management and academics, especially those who focused on understanding what service quality means, its dimensions and benefits, as well as identifying potential gaps and weaknesses in it, and how they can treatment it by bank management (Sufyan, 2023).

Study Methodology:

The researchers in this study will use statistical analysis using SPSS to calculate the arithmetic mean, standard deviation, and t-test for the study's hypotheses.

Study Limitations:

- **Objective Limitation:** The objective limits of the study included the role of artificial intelligence (AI) in its dimensions (cybersecurity, smart interfaces) in improving the quality of banking services in the Yemeni banks.
- **Geographical Limitation:** The spatial limits are represented by the number of Yemeni commercial and Islamic banks in the Yemeni capital, Sana'a, represented by their main headquarters: (Yemen International Bank, Yemen Kuwait bank, Yemen Commercial Bank, Tadhamon Bank, Shamil of Yemen and Bahrain Bank, Al-Kuraimi Bank, and CAC Bank).
- **Human Limitation:** The human limits of the study were limited to employees of the development and information technology departments, risk management, financial management, and customer service at all levels for a number of Yemeni banks in Sana'a.

Study population and sample:

The study population consists of employees of Yemeni banks in the development management, information technology, risk, finance, and customer service departments in Yemeni banks. The study sample consisted of (100) individuals working in Yemeni banks. The study sample consisted of (100) individuals working in Yemeni banks. The study distributed (100) questionnaires to Yemeni bank employees. However, (85) questionnaires were obtained, and (15) one was discarded due to its invalidity. The remaining (85) questionnaires were accepted and analyzed, and their number was (85) valid questionnaires.

Theoretical Aspect:

1- Artificial Intelligence:

Fundamentals of Artificial Intelligence:

Artificial intelligence (AI) is a branch of computer science that aims to simulate human mental abilities. It focuses on studying and understanding the nature of human intelligence and simulating it to create a new generation of intelligent computers that can be programmed to perform tasks requiring high levels of inference, deduction, and cognition.

Definition of Artificial Intelligence:

Artificial intelligence is defined as "the study and design of intelligent systems that perceive their environment and take actions that increase their chances of success."

John McCarthy, defined it as "the science and engineering of creating intelligent machines" (Al-Dalqamouni, 2022).

The term "artificial intelligence" defined as systems that combine advanced hardware and software with differential equations, databases, and knowledge-based processing models to demonstrate the characteristics of effective human decision-making (Shukla Shubhendu & Jaiswal Vijay, 2013, 28).

Based on the above definitions, researchers define artificial intelligence as "a multidisciplinary field that depends on advanced and modern computer systems that simulate banking operations and the creative behaviors distinctively human Traits".

The Importance of Artificial Intelligence:

The importance of artificial intelligence lies in multiple aspects, which can be highlighted as follows (Omar Naseer, 2019, p. 12): Intelligent systems will contribute to decision-making fields. These systems are independent, accurate, and objective; therefore, their decisions are without errors such as bias, racism, prejudice, or even external or personal interference. Furthermore, these machines will play an effective role in fields that involve many complex details, such as those require intense, tiring concentration, sustained mental presence, and sensitive, rapid decisions that cannot tolerate delay or error.

Characteristics of Artificial Intelligence:

Artificial intelligence has many characteristics, including (Ikram and Amina, 2023, 60-61).

- Using artificial intelligence to solve problems.
- The ability to think and perceive.
- The ability to acquire and apply knowledge.
- The ability to learn and understand from previous experiences and expertise.
- The ability to use past experiences and apply them to new situations.
- The ability to use trial and error to explore different issues.
- The ability to deal with difficult and complex situations.

The reality of artificial intelligence in Yemeni banks:

The Bank for International Settlements (BIS) has underscored in its annual economic report the critical role of artificial intelligence (AI) in transforming the banking sector. The report projects that AI technologies will fundamentally

reshape financial systems by: (1) enhancing predictive capabilities for economic indicators such as inflation and growth trends; (2) strengthening financial stability through advanced analytics; (3) improving risk assessment models; and (4) optimizing macroprudential regulation through real-time data processing. However, a comprehensive assessment of AI adoption across Yemeni banks—conducted through systematic analysis of their digital infrastructure, online services, and customer-facing platforms—reveals a substantial implementation gap. While AI is frequently referenced in strategic discussions, its practical integration into core banking operations remains largely aspirational. The notable exception is the Yemen-Kuwait Bank for Trade and Investment, which has emerged as a pioneer in deploying AI-driven solutions within the Yemeni financial sector.

The Yemen-Kuwait Bank has implemented several innovative AI-based platforms, most prominently the Ana Platform—a digital identity solution certified by both the Central Bank of Yemen and the Civil Status Authority. This platform offers multiple functionalities:

- Digital Onboarding: Enables remote account opening through biometric authentication
- Interoperability: Facilitates secure data sharing across financial and government institutions
- Unified Identity Management: Establishes a single, verifiable digital profile for each customer
- AI-Powered Customer Service: Includes automated response systems for internal and external queries

This case study demonstrates that while most Yemeni banks remain in the early stages of digital transformation, targeted AI implementation can yield significant operational benefits. The Yemen-Kuwait Bank's experience suggests that even in challenging economic environments, strategic adoption of financial technology can enhance accessibility, security, and efficiency in banking services (Thamer, article on the Union of Arab Banks website).

Challenges Facing Implementation of Artificial Intelligence in Yemeni Banks:

- Unstable Economic and Political Situation: The current situation in Yemen represents a significant challenge to the adoption of new and expensive technologies such as AI.
- Technological Infrastructure: Yemen's technological infrastructure may not be sufficiently developed to support complex AI applications.

- Specialized Staff: There may be a shortage of Yemeni AI specialists needed to develop and implement these technologies in the banking sector.
- Security and Regulatory Concerns: There may be concerns related to data security and regulatory compliance regarding the implementation of AI in the financial sector.

2- Banking Services:

Introduction:

Banks play a key role in developing countries' economies due to their role in financing various projects in different sectors. Banking services are one of the most important banking activities and become a measure of the success of banking institutions, as they are a fundamental pillar of competitiveness. They are also bank interface, through which customers measure the quality of the bank. Their importance increases with the continued development of the banking industry, as a focus on services has become comparable to the focus on goods, and even extends to the diversity of services provided to customers. In order to truly understand the quality of banking services, it is necessary to define the concept of banking services, their importance, and the types of banking services provided by Yemeni banks.

The concept of banking services:

Service is defined as any action or performance provided by one party to another. This action is intangible and does not lead to ownership or possession of anything. Banking services are also defined as a set of activities and operations provided by banks and financial institutions to their customers, to meeting their financial and economic needs, whether individuals, companies, or government institutions. These services include a wide range of operations that contribute to facilitating financial transactions, achieving financial security, and promoting economic development (Saudi Arabian Monetary Agency, 2003).

The Importance of Banking Services:

Banking has a significant economic impact. many studies have proven that it is not only a tool for wealth management, but a strategic partner in the process of economic development, making it an indispensable element in the structure of any society. Banking services are a pivotal component of the financial system, providing effective means for managing funds, stimulating investment, and

enhancing economic stability. They are not limited to simply storing funds or facilitating withdrawals and deposits, but include a wide range of financial solutions such as loans, real estate financing, electronic services, and international transfers, enabling individuals and institutions to achieve their financial goals efficiently and safely (Trade and Development Report, 2023). The importance of banking services also in their developmental role, as they contribute to supporting small and medium enterprises and enhancing financial inclusion by providing access to financing for various segments of society, including remote areas or low-income groups. Banks also keep pace with technological progress by providing digital banking services that contribute to facilitating daily life and accelerating the pace of business (Daifallah Ashwaq et al., 2023).

Banking Services Provided by Yemeni Banks:

The most important services provided by Yemeni banks to their customers (Central Bank website and several Yemeni bank websites):

Traditional Banking Services:

Granting Loans:

Loans are an important element in driving the economy. Banks grant their customers loans to meet their needs, to be repaid in periodic installments with an agreed-upon interest and commission. There are many types of loans, including personal loans, housing loans, car loans, and others.

Documentary Credits:

Documentary credits are considering the most important banking services provided by banks in general. As it is considered the foundation Activity (import and export) throughout the world. through banks' correspondent networks around the world.

Money Transfers:

Many citizens need to transfer money within and outside the country. The purpose of the transfer varies, personal, commercial, and some to settlement of obligations. This service is performed by banks for a limited fee.

Current Account:

A current account is a customer's account through which funds can be deposited, payments and salaries received, and obligations settled. Customers with a current account may obtain checkbooks unless they have used them in violation of the law.

Electronic Banking Services

Credit Cards:

The use of various types of credit cards (Visa, MasterCard, etc.) has recently become widespread as a modern alternative to carrying cash. This is due to their

security advantages, ease of use, and international acceptance by all commercial and service establishments. These cards are used by customers to pay for purchases, use hotel services, travel by plane, and other.

E-wallets:

E-wallets are a modern electronic payment method. They are digital applications or services used to store money electronically. They allow customers to conduct financial transactions such as buying and selling, paying bills, transferring money, and shopping online or in stores easily and quickly via smartphone or the internet, without need to carry cash or use bank cards directly.

Mobile banking:

A service provided by banks that allows customers to conduct banking transactions using their mobile without having to visit the bank. These services include transferring funds between accounts, checking balances, paying bills, blocking bank cards in the event of loss or theft, and requesting a checkbook or account statement. This service is typically provided via voice calls to an automated system or customer service representative, saving time and effort without need for the internet or smart applications.

Online Banking:

An electronic service provided by banks that allows customers to access their accounts and conduct most banking transactions, such as transferring funds locally and internationally, paying bills and government fees, requesting new checkbooks or cards, and opening accounts or savings certificates electronically via the bank's official website, without need to visit the bank.

Field Study Results:

First: Study Methodology and Procedures

The study adopted the descriptive, analytical, and causal-correlational approach to describe the relationship between the use of artificial intelligence and the improvement of the quality of banking services.

Second: Study Tools

The researcher used a questionnaire as the primary tool for collecting the necessary data for the study. The questionnaire consisted of two sections:

- **Section One:** Included seven demographic variables related to the personal and professional characteristics of the study sample, namely:
 1. Gender
 2. Age
 3. Educational qualification
 4. Specialization
 5. Workplace
 6. Field of work
 7. Work experience
- **Section Two:** Focused on the core data of the study, representing the key axes through which the study variables were identified. This section included three main axes:
 1. **Axis One:** Measures Artificial Intelligence (AI), and consists of two dimensions:
 - Dimension One: Measures Cybersecurity, and includes (8) statements.
 - Dimension Two: Measures Smart Interfaces, and includes (8) statements.
 2. **Axis Two:** Measures Banking Services, and includes (8) statements.
 3. **Axis Three:** Measures the Current Status of AI in Yemeni Banks, and includes (8) statements.

Third: Study Population and Sample

The study population consisted of all employees working in Yemeni banks. A simple random sampling method was applied. The questionnaire was designed using Google Forms, and the link was distributed electronically to a total of 100 individuals. The researcher received 85 responses, all of which were valid and suitable for analysis. Table (1) illustrates these details.

Table (1): Distribution of the Questionnaire and Response Rate

Statement	Number	Percentage
Number of employees who received the questionnaire link	100	100%
Number of responses received	85	85.0%
Number of employees who received the link but did not respond	15	15.0%
Net number of valid and analyzable responses	85	85.0%

Based on the following formula:

$$(\text{Upper Limit} - \text{Lower Limit}) / 3 = \text{Category Length}$$

$$(5 - 1) / 3 = 1.33 = \text{Category Length}$$

The arithmetic mean scale is based on its three dimensions as shown in Table (2). This is used to interpret the acceptance level of the research sample's responses to each item in the questionnaire, as well as to each dimension and axis. The interpretation is as follows:

Table (2): Criteria for Coding the Study Sample Responses and the Arithmetic Mean Scale with Its Dimensions

Mean Score Range		Level of Acceptance
From 1.00	less than 2.33	Low
From 2.33	less than 3.66	Moderate
From 3.66	to 5.00	High

Fourth: Instrument Reliability (Questionnaire)

To verify the reliability of the measurement instrument, Cronbach's Alpha coefficient was used. The coefficient was calculated to determine the internal consistency of the items in the questionnaire for each of its dimensions. Table (3) presents the results.

Table (3): Cronbach's Alpha Reliability Coefficients for the Dimensions of Artificial Intelligence and Banking Services

	Number of Items	Cronbach's Alpha
Dimension 1: Items related to Cybersecurity	8	87.9%
Dimension 2: Items related to Smart Interfaces	8	85.3%
Total items of the Artificial Intelligence axis	16	92.0%
Items related to the Banking Services axis	8	91.6%
Items related to the Reality of Artificial Intelligence in Yemeni Banks	8	87.3%

Total	32	94.0%
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The results shown in Table (3) indicate that the reliability coefficients (Cronbach's Alpha) for the Artificial Intelligence axis reached (92.0%), and (91.6%) for the Banking Services axis. The overall reliability for the entire questionnaire was (94.0%). All these values are statistically significant and exceed the acceptable threshold of 60%, indicating that the instrument (questionnaire) used for data collection is highly reliable. This supports the validity of the research and ensures the soundness and credibility of the statistical analysis.

Statistical Methods Used

1. Reliability Test using Cronbach's Alpha: Employed to assess the internal consistency and reliability of the questionnaire items.
2. Percentages and Frequencies: Primarily used to describe the demographic characteristics of the study sample.
3. Arithmetic Mean: Used as an indicator for ranking the dimensions and items in terms of their importance from the participants' perspective, in order to determine the level of implementation of the study variables.
4. Standard Deviation: Used to measure the extent to which the responses of the study sample deviate from the arithmetic mean for each statement related to the study variables.
5. One-Sample t-test: Used to assess the level of respondents' agreement with the statements of the study's dimensions and axes. A positive t-value with a significance level less than 0.05 indicates no significant difference in opinions among participants regarding the items of each dimension.
6. Simple Linear Regression Analysis: Applied to test the statistical significance of the sub-hypotheses derived from the main hypothesis. This method measures the effect of each independent variable individually on the dependent variable.

Table (4): Frequency Distribution of Personal and Occupational Variables

Variable		Fr.	%
Gender	Male	61	71.8
	Female	24	28.2
	Total	85	100.0
Age	30 years or below	17	20.0
	31 to 40 years	43	50.6

Variable		Fr.	%
	41 to 50 years	22	25.9
	Over 50 years	3	3.5
	Total	85	100.0
Educational Qualification	Diploma	6	7.1
	Bachelor's Degree	57	67.1
	Postgraduate Studies	22	25.9
	Total	85	100.0
Specialization	Accounting	29	34.1
	Management	21	24.7
	Finance and Administration	11	12.9
	Information Technology	19	22.4
	Others	5	5.9
	Total	85	100.0
Employer Type	Government Bank	42	49.4
	Commercial Bank	24	28.2
	Islamic Bank	15	17.6
	Microfinance Bank	4	4.7
	Total	85	100.0
Job Field	Information Technology	14	16.5
	Development Management	18	21.2
	Payment Management	10	11.8
	Risk Management	15	17.6
	Financial Affairs & Customer Service	28	32.9
	Total	85	100.0
Experience	5 years or less	24	28.2
	6 to 10 years	17	20.0
	11 to 20 years	34	40.0
	Over 21 years	10	11.8
	Total	85	100.0

Table (4) shows that the majority of participants are male (71.8%), and most of them are aged between 31 and 40 years, indicating an active professional group. The majority hold a bachelor's degree (67.1%) and are mainly specialized in accounting and management. Most respondents work in government banks

(49.4%) and are primarily employed in financial affairs and customer service roles. Additionally, around 40% have between 11 and 20 years of experience, reflecting a blend of relevant expertise and specialization in the banking sector.

Question One: What is the level of Artificial Intelligence (AI) implementation?

Table (5): Descriptive Statistics of the Artificial Intelligence Dimensions

No.	Dimension	N	Mean	Std. Deviation	Relative Importance %	Test Statistic	Sig. Level	Assessment Level	Rank
1	Cybersecurity	85	4.19	0.547	83.8%	8.938	0.000	High	First
2	Smart Interfaces	85	4.07	0.483	81.5%	7.891	0.000	High	Second
	Total	85	4.13	0.482	82.6%	9.026	0.000	High	

Table (5) shows that the mean scores for AI dimensions were high, with an overall mean of (4.13), a standard deviation of (0.482), and a relative importance of (82.6%). This indicates a strong agreement among the study sample on the significance of AI dimensions in enhancing banking service quality.

Cybersecurity ranked first with a mean of (4.19) and relative importance of (83.8%), reflecting strong awareness among bank employees of the need to protect data in AI environments. **Smart Interfaces** came second with a mean of (4.07) and relative importance of (81.5%), highlighting appreciation for smart customer interaction systems.

All t-test values were statistically significant at ($p = 0.000$), confirming that the means are significantly different from the neutral value. This supports the reliability of the results and indicates positive perceptions of AI application dimensions.

Table (6): Descriptive Statistics of the Artificial Intelligence Dimensions

No.	Dimension	N	Mean	Std. Deviation	Relative Importance %	Test Statistic	Sig. Level	Assessment Level	Rank
1	Artificial	85	4.13	0.482	82.6%	9.026	0.000	High	1

No.	Dimension	N	Mean	Std. Deviation	Relative Importance %	Test Statistic	Sig. Level	Assessment Level	Rank
	Intelligence								
2	Banking Services	85	4.07	0.483	81.5%	7.891	0.000	High	2
3	Reality of AI in Yemeni Banks	85	3.59	0.688	71.7%	-0.999	0.321	Moderate	3

As shown in Table (6), the dimension of Artificial Intelligence ranked highest among the three measured aspects, with a mean of 4.13, a standard deviation of 0.482, and a relative importance of 82.6%, indicating a strong perception among respondents regarding the value of AI in enhancing banking operations. Similarly, the Banking Services dimension also received a high evaluation, with a mean of 4.07 and relative importance of 81.5%, reflecting a positive view of the improvements brought by AI to service quality.

In contrast, the dimension Reality of AI in Yemeni Banks scored lower, with a mean of 3.59, standard deviation of 0.688, and relative importance of 71.7%, placing it at a moderate level of assessment. Furthermore, the test statistic for this dimension ($t = -0.999$, $p = 0.321$) was not statistically significant, suggesting no meaningful difference from the neutral value. This implies that despite recognizing the importance of AI and its potential benefits, respondents perceive its actual implementation in Yemeni banks as relatively limited. The gap identified in Table (7) highlights the need for more strategic efforts to enhance the adoption and practical integration of AI technologies in the Yemeni banking sector.

Hypothesis Testing

Table (7): Simple Linear Regression Indicators for Testing the Hypothesis

Dependent Variable	Improvement of Banking Services							
Independent Variable	β Coefficient	Std. Error	t-Statistic	Sig. Level	R	Adjusted R ²	F Significance	Result
Cybersecurity	0.849	0.082	10.299	0.000	0.804	0.646	0.000	Significant
Smart Interfaces	0.903	0.085	10.587	0.000	0.758	0.569	0.000	Significant
Artificial Intelligence	0.928	0.083	11.239	0.000	0.777	0.599	0.000	Statistically Significant

Based on the results presented in Table (7), the impact of both **Cybersecurity and Smart Interfaces**, as well as their combined effect as a composite variable representing Artificial Intelligence, on improving the quality of banking services in Yemeni banks can be analyzed as follows:

Regarding Cybersecurity, the results of the simple linear regression analysis indicate that it has a significantly strong impact on improving banking service quality. The regression coefficient (β) was 0.849, which means that for every one-unit increase in the adoption of cybersecurity measures, the quality of banking services increases by 0.849 units. The t-statistic was 10.299, with a significance level of 0.000, indicating a highly significant effect. The correlation coefficient (R) was 0.804, suggesting a strong positive relationship, and the adjusted R² was 0.646, meaning that cybersecurity accounts for 64.6% of the variance in the quality of banking services. This reflects a high level of awareness among banking sector employees regarding the importance of securing data and systems from digital threats as a crucial factor in banking performance quality.

As for Smart Interfaces, the results were also positive and statistically significant. The regression coefficient (β) was 0.903, indicating that every one-unit increase in the use of intelligent interface technologies leads to a 0.903-unit improvement in service quality. The t-statistic was 10.587, with a significance level of 0.000, confirming the significance of the relationship. The correlation coefficient (R) reached 0.758, and the adjusted R² was 0.569, indicating that Smart interfaces explain about 56.9% of the variation in service quality. This suggests that

customer-interactive systems, such as chatbots and smart applications, significantly enhance the customer experience and improve service efficiency.

At the level of Artificial Intelligence as a composite variable (Cybersecurity + Smart Interfaces), the analysis showed a strong and significant impact on banking service quality. The regression coefficient (β) was 0.928, the highest among all values, indicating that the integration of both dimensions yields a stronger effect. The t-statistic was 11.239, with a significance level of 0.000, while the correlation coefficient (R) was 0.777 and the adjusted R^2 was 0.599, showing that the combined dimensions of artificial intelligence explain 59.9% of the variance in banking service quality. These findings emphasize the importance of integrating multiple dimensions of AI rather than relying on just one to enhance service quality.

In conclusion, both Cybersecurity and Smart Interfaces play a vital role in improving the quality of banking services, whether independently or jointly. Integrating these two dimensions within an AI-driven banking system offers a broader and more effective approach to enhancing banking performance in Yemen. Therefore, the study recommends investing in intelligent digital infrastructure, with a focus on system protection and enhancing digital customer interaction.

Final Results:

1. The findings revealed that artificial intelligence applications significantly contribute to improving the quality of banking services by reducing errors, accelerating transactions, increasing customer satisfaction, and providing flexible and diverse options.
2. The results showed that the perceived level of various AI elements in Yemeni banks was moderate overall, except for the item concerning the impact of political and economic crises, which received a high rating. This indicates the existence of real challenges that hinder the optimal adoption of artificial intelligence.
3. The analysis indicated that artificial intelligence, as an independent variable, has a statistically significant and strong effect on improving the quality of banking services, with an adjusted coefficient of determination ($R^2 = 0.599$). This means that AI explains approximately 60% of the variation in service quality.

4. The results showed that **cybersecurity** is the most influential dimension in improving banking services compared to **Smart interfaces**, explaining 64.6% of the variance in service quality. This reflects that enhancing digital protection is a top priority for both customers and Yemeni banking institutions.
5. The findings highlighted that AI technologies contribute to reducing transaction processing time and that AI-powered services provide more diverse options—indicating that time efficiency and variety of choices are among the key advantages of AI in banks.
6. The study confirms that artificial intelligence serves as a strategic tool to enhance the quality of banking services in Yemeni banks through improving digital security and enabling intelligent interaction with customers.
7. Cybersecurity holds the highest priority as the most impactful AI dimension in service enhancement, underscoring the importance of investing in electronic protection systems to safeguard customer data and build trust.
8. Smart interfaces also play a vital role in enhancing customer experience and achieving service excellence.
9. The statistical significance of all AI dimensions reflects strong consensus among bank employees on the effective role of artificial intelligence. Therefore, AI-driven digital transformation is not optional, but a necessity to improve performance and meet customer expectations in the Yemeni banking sector.

Recommendations

1. The study recommends expanding the use of artificial intelligence applications in Yemeni banks, especially in operational processes that require speed and accuracy, to enhance customer satisfaction, reduce errors, and increase efficiency.
2. It is essential for decision-makers in the banking sector to provide a relatively stable and supportive environment for adopting AI technologies through incentive policies and by overcoming political and economic challenges.
3. The study recommends integrating artificial intelligence into banking development strategies, given its clear impact on improving service quality and streamlining operations.

4. The study calls for increased investment by banks in cybersecurity infrastructure and for ensuring that protection systems are regularly updated to safeguard customer data and build lasting trust.
5. The study encourages leveraging AI capabilities to develop new, flexible, and fast services that meet diverse customer needs and offer an advanced banking experience.
6. The study recommends incorporating artificial intelligence into banks' strategic plans and adopting it as a core pillar for improving performance and service quality in the banking sector.
7. The study emphasizes the need for continuous training programs for employees on cybersecurity principles and raising digital security awareness among all stakeholders in banks.
8. The study recommends developing interactive smart interfaces that address customer needs and improving digital communication channels to provide more personalized and effective banking services.
9. The study urges the adoption of clear policies for comprehensive digital transformation in the banking sector, with a strong focus on artificial intelligence as a necessary tool for achieving quality, innovation, and meeting customer expectations.

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