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# **THE IMPACT OF USING ARTIFICIAL INTELLIGENCE APPLICATIONS ON MITIGATING RISKS IN BANKING OPERATIONS: A FIELD STUDY APPLIED TO AL RAJHI BANK AND AL AHLI BANK**

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**Abstract:** In recent times, banking risks have increased, impacting numerous financial institutions and leading to financial distress due to fraudulent activities and manipulation. This study explores the potential of mitigating such risks through the application of artificial intelligence, especially in the information age. The objective of this research was to examine the relationship between the use of artificial intelligence techniques in commercial banks and various aspects of banking operations. Statistical regression analysis was employed to evaluate the main hypotheses related to the impact of these technologies on reducing banking risks and the ability of banks to keep pace with global developments. Regression analysis results revealed a statistically significant correlation between the use of artificial intelligence techniques in commercial banks and both the reduction of banking risks and the alignment with global financial and banking advancements. Consequently, the findings suggest a positive relationship between the implementation of artificial intelligence in banks and the enhancement of risk management in banking operations, as well as staying updated with global trends in the financial and banking sector. Furthermore, the study identified key obstacles hindering the full utilization of artificial intelligence technologies in commercial banks. The results also indicated that commercial banks prioritize attracting and employing highly skilled human talents to ensure the achievement of their goals and the realization of planned strategic objectives. Commercial banks possess modern technologies and artificial intelligence techniques, contributing to the facilitation of banking operations, data analysis, international communications, and the reduction of money laundering, fraud, and cheating risks. However, the actual use or optimal investment in artificial intelligence applications remains limited due to technical and informational constraints and the shortage of specialists in this field.

**keywords:** Artificial intelligence - Banking risks - Al Rajhi Bank and Al Ahli Bank

## **Introduction:**

Banking institutions face numerous changes and challenges (whether financial, industrial, or service-oriented). These challenges have led to the emergence of new concepts in institutional

management aimed at achieving the goal of survival and continuity in the competitive world and keeping pace with technological advancements. This involves changing their traditional methods that do not align with the challenges they face and adopting modern scientific and practical techniques to enable the institution to deal with and overcome these challenges to achieve optimal performance levels.

The efficient and effective use of artificial intelligence applications by these institutions can significantly contribute to facilitating banking operations, data analysis, and international communications, and mitigating risks such as money laundering, fraud, and cheating. It has been found that there is a statistically significant relationship between the application of artificial intelligence techniques and the mitigation of banking risks.

Banks have become compelled to keep up with technological advancements and work to bridge the gap between them and the rapid developments in artificial intelligence. They should strive to attract and employ highly skilled human resources to ensure the achievement of their goals and reach planned strategic objectives. This includes supporting all banking tasks and functions, credit analysis, and investment analysis, as well as enhancing and developing the flow of banking information. All of these efforts are poised to positively impact the reduction of banking risks for these banks and enhance their overall performance efficiency.

#### - Artificial Intelligence:

Specific behaviors and characteristics of computer programs that enable them to simulate human mental abilities and patterns of work. Among the most important of these characteristics is the ability to learn, infer, and react to situations not explicitly programmed into the machine (Makkaw, Artificial intelligence is at the gates of education., 2018-p22))

#### - Banking Risks:

Defined by the Banking Regulation and Risk Management Committee of the Banking Sector Regulatory Authority in the United States (FSR) as "the probability of loss, either directly through losses in business results, or losses in capital, or indirectly through constraints that limit the bank's ability to continue its operations and activities on one hand, and limit its ability to exploit available opportunities in the banking environment on the other hand" (TFSRT T. F., (1999)

#### - Chat Robots:

They act as agents for customer service, with these innovative applications commonly linked to popular instant messaging platforms such as Facebook, Messenger, and WhatsApp. Chat Robots are distinguished by advanced features to effectively handle customer inquiries sent through electronic platforms.

#### - Polymer:

Polymer is a powerful artificial intelligence tool that provides strong AI to convert data into a simplified, flexible, and robust database. Similar to other fantastic artificial intelligence tools, one of the best aspects of Polymer is that it does not require any coding.

### **The Study Problem:**

The study problem revolves around the extent of using artificial intelligence applications in financial institutions and its impact on mitigating banking risks. Based on this, the study problem

can be formulated into the following question: "To what extent can the use of artificial intelligence techniques contribute to mitigating banking risks?"

From this main question, the following sub-questions are derived:

- What is the current status of applying artificial intelligence techniques in commercial banks?
- What is the impact of using artificial intelligence techniques on mitigating banking risks?
- What are the obstacles to the use of artificial intelligence techniques in commercial banks?

### **Study Hypothesis:**

In light of the study problem and line with its objectives and significance, we aim to test the following hypotheses:

First Hypothesis: There is no significant relationship between the use of artificial intelligence techniques in commercial banks and the mitigation of banking risks.

Second Hypothesis: There is no significant relationship between the application of artificial intelligence techniques in commercial banks and keeping up with global financial and banking advancements.

### **Study Objectives:**

The study aims to:

1. Identify the current status of applying artificial intelligence techniques in commercial banks.
2. Clarify the impact of using artificial intelligence techniques on mitigating banking risks.
3. Highlight the main obstacles hindering the application of artificial intelligence techniques in commercial banks.

### **Study Significance:**

The significance of the study lies in its expected benefits in both academic and scientific fields, in addition to the following aspects:

- Scientific Significance: The scientific significance of the study stems from its theoretical background related to the application of artificial intelligence techniques in commercial banks and its results, which may help improve the use of artificial intelligence in financial institutions from all scientific aspects.
- Practical Significance: The application of artificial intelligence techniques helps enhance reliable information in local financial and banking operations, connecting them globally.

### **Study Methodology:**

In light of the nature of the problem, significance, and objectives of the study, the study relies on the descriptive-analytical methodology in preparing the study. This methodology involves studying the phenomenon as it exists in reality, describing it accurately, analyzing the

phenomenon, and interpreting it to reach conclusions that contribute to the development and improvement of reality.

### **Study Boundaries:**

- Objective Boundaries: The study is limited to the reality of applying artificial intelligence techniques in commercial banks and their impact on mitigating banking risks.
- Geographic Boundaries: Financial and banking departments in Al Rajhi Bank and Al Ahli Bank in Hafar Al-Batin and other branches in the Kingdom, as the survey will be distributed electronically during the period from October 2023 to February 2024.

### **Study Plan:**

In an attempt to answer the questions of the study problem, achieve the study objectives, test the study hypothesis, and rely on the descriptive-analytical methodology to reach the most important results and provide recommendations, this study is divided as follows:

#### **General Framework of the Study**

- First Topic: Theoretical Study - Applications of Artificial Intelligence in Banking Operations - Conceptual Framework.
- Second Topic: Identifying the current status of applying artificial intelligence techniques in commercial banks and the benefits they achieve in financial management.
- Major obstacles hindering the application of artificial intelligence techniques in commercial banks.

Then:

- Applied Study in the Financial and Banking Departments of Al Rajhi Bank and Al Ahli Bank and Financial and Information Technology Managers.
- Results and Recommendations.

### **Previous Studies:**

1- Abu Bakr Khalid and Kheir Eddine Bouzrabe's study (2020) at the University of Djelfa focused on the effectiveness of using modern artificial intelligence applications in combating the Coronavirus (COVID-19): South Korea's experience as a model. This study aimed to clarify the role of artificial intelligence applications in combating the Coronavirus by studying South Korea's experience in this field. It consisted of a theoretical part discussing the nature of artificial intelligence and its recent applications in the medical field, and an analytical part presenting and analyzing the Korean experience. The study concluded that South Korea employed various modern artificial intelligence applications in combating the Coronavirus by relying on advanced algorithms and information systems. The study recommended the necessity of establishing strategic alliances in the medical and technological fields between South Korea and the rest of the world to benefit from its experience in this area.

(Khawalid K. A.-A., (2020))

2- Amarria Bakhiti and Ghania Maghani's study (2020) titled "The Role of Financial Technology in Supporting the Banking Sector" aimed to analyze the role of financial technology companies in developing and supporting the banking sector through the services they provide. The researchers used a descriptive-analytical method and found that financial technology contributes to the development of electronic financial services and also enhances the profitability of the service sector.

(Falta A. R., (2020-p7))

3- A study by Al Nuaimi (2002) titled "Measuring Strategic Risk Using Strategic Financial Indicators - An Applied Study of a Sample of Sudanese Banks" aimed to analyze strategic risk using financial indicators and demonstrate the impact of this risk on the financial performance of banks. The study concluded that there is a negative impact of strategic risk on the financial performance of banks. It also emphasized the importance of developing organizational capabilities, implementing activities efficiently, and dealing constructively with the external environment to achieve good strategic financial performance.

(Al-Naimi, Measuring strategic risk using financial indicators of a strategic nature, an applied study of a sample of Sudanese banks , (2002))

4- Asmaa Ali Gouanma, Ashraf bin Muhammad Ramli, Abdullah bin Jalil, and Muayyad Fadhil Alawneh's study (2023) titled "The Impact of Artificial Intelligence Systems on Improving the Quality of Banking Services in Jordanian Islamic Banks" aimed to explore the possibility of applying and using artificial intelligence systems in Jordanian Islamic banks. The study also aimed to identify the impact of artificial intelligence systems on improving the quality of banking services in Jordanian Islamic banks across their five dimensions: reliability, responsiveness, empathy, assurance, and tangibility. The results aligned with expectations, showing the significant impact of using artificial intelligence systems on improving the quality of banking services in Jordanian Islamic banks. The study recommended continuous development of Islamic banking systems to keep pace with global automation and digitization, incorporating the latest technologies such as artificial intelligence. (Ashraf bin Muhammad Ramli, (June, 2023))

### **Commentary on Previous Studies:**

Most of the previous studies focused on the application of artificial intelligence systems to improve financial reporting transparency and the definition of artificial intelligence and its impact in the financial field, highlighting various applications of artificial intelligence in financial institutions and their role in enhancing and activating digital applications. However, they did not address specific risks but focused on artificial intelligence applications. Therefore, this study aims to clarify the impact of using artificial intelligence techniques in mitigating banking risks and highlight the main obstacles hindering their application in commercial banks.

### **Theoretical Framework**

#### **Concept and Characteristics of Artificial Intelligence**

##### **2-1- Concept of Artificial Intelligence**

Recently, the concept of artificial intelligence has garnered widespread interest across all areas of life, particularly in finance and banking. This interest has prompted many organizations and banks to adopt it as a fundamental strategy to enhance their performance, ensuring their survival, and continuity, and keeping pace with technological advancements to enhance growth opportunities. The diversity of perspectives among researchers on the concept of artificial intelligence is due to the variation in their research fields, including sociology, psychology, economics, and management science, resulting in a wide range of definitions. (Khawalid K. B.-A., (2020)

According to Brien'O, artificial intelligence is "a science and technology based on several cognitive fields such as computer science, mathematics, biology, philosophy, and engineering, aimed at developing computer functions to simulate human intelligence." Thus, it encompasses various cognitive fields interacting to program machines in a technical manner that allows them to simulate human thinking. (Nouri, 2012))

Levin and others define it as "how a computer becomes intelligent, resembling human thought." This definition implies that artificial intelligence is an attempt to make machines think like humans.

(Al-Kurdi., (2003))

Rolston defines it as "a load placed on the computer for the most complex problems through applied processes that resemble human reasoning." Therefore, it can be said that programming computers with highly advanced applications enables them to solve complex problems that humans can solve, but in a fast and accurate manner.

(Fawzi, (2009-p. 274))

Waterman views it as "representing knowledge as sets of symbols representing problem concepts, and in the realm of artificial intelligence, the symbol becomes a cipher of letters representing a concept from the real world." Thus, it serves as a science and technology based on branches of operation such as computer science, psychology, linguistics, mathematics, and engineering, aiming to develop computers that can think, move, and behave. (Turpan., (2000 p580).)

The use of artificial intelligence began in the early 1960s when a scientist (Minsky) published a paper entitled "Steps Toward Artificial Intelligence," evolving the concept to refer to a specialized scientific field aimed at programming computers to possess the ability to think, solve problems, make decisions, distinguish sounds and images, and understand texts written in natural language.

(Al-Malkawi, Knowledge Management Practices and Concepts - -, 2007, p. 217. 1st )

Therefore, artificial intelligence is an advanced technique aimed at developing computer functions to simulate the intelligence processes that occur within the human mind. It requires a data system used to represent information and knowledge, algorithms needed to depict how this information is used, and a programming language used to represent both information and algorithms. This enables computers to solve problems, make logical and structured decisions, and contribute to managing operations and tasks with more advanced and intelligent mechanisms than humans, who created and endowed them with knowledge and sensory capabilities, enabling them to learn automatically and evolve. Artificial intelligence is one of the most successful fields at present, (Sheherazade Al-Wafi a. H., 2021) transitioning from research to commercial use, proving its efficiency in various

fields and enabling its application in many business applications in companies and economic institutions. (Zuhair, . (2020-p93).)

Regarding artificial intelligence and banking, it is expected that the banking sector will benefit widely from artificial intelligence systems. Specialized reports indicate the expected role of artificial intelligence technologies in enabling banking to achieve savings exceeding \$1 trillion by 2030. In contrast, PwC Middle East expects technology to contribute \$320 billion to the total GDP in the Middle East during the same period. Given the immense potential of artificial intelligence technologies and the increasing demand for high-tech banking services by technology-savvy customers, many financial institutions have turned to adopting artificial intelligence as part of their relentless pursuit of leadership in the digital age, where automation is one of its prominent features. (Amin., (2016-p13))

Global development is closely linked to the use of artificial intelligence and big data. Artificial intelligence can contribute up to \$15.7 trillion to the global economy by 2030, which is more than the current GDP of China and India combined. (Badaro, 2013-p349-364)

(<https://www.pwc.co.uk>, 2017-p8-28)

## **2-2- Characteristics of Artificial Intelligence:**

Artificial intelligence is characterized by several features that have attracted researchers' interest:

- Using intelligence to solve presented problems in the absence of complete information.
- The ability to think and perceive.
- The capability to acquire knowledge and apply it practically.
- The possibility of learning and understanding from previous experiences and experiments.
- Utilizing old experiences and applying them in new situations.
- The ability to use trial and error to discover different matters.
- Quick response to new situations and circumstances.
- Dealing with difficult and complex cases.
- Handling ambiguous situations in the absence of information.
- The ability to discern the relative importance of elements in presented cases.
- Providing information to support managerial decisions.

(Al-Najjar, . Management information systems, an administrative perspective -, (2010-p170))

## **2-3- Applications of Artificial Intelligence and the Processes Carried Out in Banks:**

Through the diversity of artificial intelligence applications, what is known as the artificial intelligence family has been formed, each of which has a set of processes performed at its level.

The artificial intelligence family consists of various practical applications related to many operational fields, each performing different functions that humans can do but not with the same speed and accuracy as these applications. These include natural language processing, expert systems, visual systems, fuzzy logic, genetic algorithms, robotics, visual systems, neural networks, and intelligent agents. Therefore, artificial intelligence has many applications, each with a specific role, programmed on certain rules to perform various tasks and functions according to the purpose for which they were created, to assist users in many fields.

(Fromm, The role of information systems based on artificial intelligence in the administrative decision-making process , (2019-p6))

### **2-3- Reasons for Adopting Artificial Intelligence:**

There are multiple reasons for adopting artificial intelligence in organizations, as it contributes to cost reduction, thereby supporting competitiveness. Global artificial intelligence in the financial technology market was estimated at around \$7.91 billion in 2020, and it is expected to reach \$26.67 billion by 2026. The market is also expected to witness a compound annual growth rate of 23.17% during the forecast period (2021-2026). Among the most important reasons are:

- a. Meeting customer demands for offers.
- b. Presentation of new services and products by competitors.
- c. Reducing and limiting costs.
- d. Competition.
- e. Entry of new organizations into the market.
- f. Expansion into new markets.
- g. Gaining and maintaining a competitive advantage.

)Intelligence artificielle et éthique, La Fabrique d'Assurance 2019 ← .p20)

### **2-3-2- The Experience of Saudi Arabia According to its Vision for 2030:**

In pursuit of the goals of Vision 2030 and unleashing the capabilities of the Kingdom, the authority aims to transform the Kingdom's economy into a globally leading data-driven economy by the year 2030.

Saudi Arabia has witnessed the launch of the "AI Artathon" competition with the participation of a large number of artificial intelligence data experts worldwide to discuss innovating the best artistic works using artificial intelligence techniques. Additionally, it became the first bank to train all its employees in artificial intelligence, as the first bank collaborated with Reactor Company in the technology field, aiming to provide all its employees with basic information about artificial intelligence to be the first institution in the Middle East to train all its employees in artificial intelligence. The first bank seeks, through providing employees with basic information about artificial intelligence, to lead the financial services sector in the region in using a technology expected to contribute \$320 billion (11%) to the Middle East's gross domestic product by 2030.



The bank took an unusual step in training all its employees on new technologies, and the employees of the first bank will use an online course developed by Reactor Company specifically to explain the basic elements of artificial intelligence work to non-specialists in the digital field.

(Magdy, Introductory booklets series, Issue 3,. . Series of introductory booklets, Issue 3, directed to the young age group in the Arab world - Arab Monetary Fund. , , 2020, p. 121.)

## **Banking Operations**

### **2-1- Banking Operations:**

Banking operations involve various activities that revolve around managing funds from depositors, providing them in exchange for interest, extending loans, and facilitating transactions such as transfers, withdrawals, and more. These activities encompass a range of services offered by financial institutions, including savings and checking accounts, advising clients, financing projects, providing investment services, managing financial assets, engaging in and financing investments, funding projects, and supporting trade and industrial ventures. (Shabib, Banking Operations Management, 1st edition., 2015-p31))

Banks also play a vital role in economic activity, as their impact extends beyond the financial sector to other areas due to interconnected relationships among banks within and outside the country. (Bessis, 1998 )

Banks are exposed to various risks according to the nature of their activities. The key characteristic of banks today is their ability to deal with risks, which have diversified beyond traditional credit risks to include various other types of risks. The recent failures of many banks and financial institutions can be attributed not only to credit risks but also to other types of risks.

The primary concern for future banks is not just about money but about risk-taking. Banks can gain a competitive edge over their rivals by maximizing returns through risk-taking. Understanding the concept of risk and its types is crucial in banking operations.

### **Definition of Risks and Their Types:**

Risk, according to Joel Bessis, represents adverse effects on profitability resulting from various uncertainties. Measuring risk involves assessing the impact of unfavorable events that occur under uncertain conditions on profitability. (Bessis, 1998)

Hindi defines risk as the fluctuation in future returns, a definition concurred with by Sinkey, who asserts its common usage in finance.

(Muhannadi. M. I., (2006-p6))

### **2-2- Banking Risks:**

The Banking Regulation and Risk Management Committee, formed under the U.S. Banking Sector Authority, defines banking risks as the probability of loss, either directly through business results or capital losses, or indirectly through constraints limiting the bank's ability to continue operations and pursue opportunities in the banking environment.

(SIMONSON, 1999)

### **2-3- Types of Banking Risks:**

Banks are exposed to various risks, each with its classifications. Some of these risks are outlined as follows

)Al-Hinnawi 'Investment in securities and risk management - '(2007p357))

1. Strategic Risks: Arise from poor management decisions.
2. Reputational Risks: Stem from negative perceptions from external parties.
3. Market Risks: Result from changes in external market conditions, market structure, instruments, exchange rates, and local markets, as well as fluctuations in interest rates.
4. Credit Risks: Occur due to the failure of borrowers to fulfill their obligations on the specified dates.
5. Interest Rate Risks: Arise from movements in interest rates.
6. Liquidity Risks: Stem from the bank's inability to meet its financial obligations (withdrawals, loan requests) on time without incurring any unacceptable losses or costs in fulfilling those financial obligations.
7. Trust/Fidelity Risks: Result from management's failure to instill trust within the bank, especially in customer accounts.
8. Operational Risks: Result from failures in internal control, policy formulation, and operational processes, negatively affecting the products offered to bank customers.
9. Compliance Risks: Arise from non-compliance with or improper implementation of laws, regulations, and defined standards  
(COCBEO, JAN 1997-p47)

### **2-4- Causes of Increased Banking Risks:**

The reasons for the increase in risks in the banking sector amid current financial globalization are attributed to the following factors:

- a. Increased competitive pressures, leading to the encouragement of risk-taking to achieve the highest possible profit for invested capital and to gain the largest possible market share.
- b. Banks' expansion beyond predefined boundaries and their transition from traditional businesses to financial markets, exposing them to liquidity crises as well as other market risks and inflation.
- c. Fundamental changes in banking and financial markets in recent years due to the relaxation of restrictions on capital movements and the opening of local markets.
- d. Increased risks in their various forms faced by banks, encompassing many types of risks that were previously not a concern  
(Salam, (2007-p43))

### **2-5- Risk Management Steps:**

1. Identifying Risks:

For the bank and its management to effectively manage risks, it is essential to first identify these risks. Every product or service offered by the bank encompasses several risks, including interest rate risk, lending risk, liquidity risk, and operational risk.

## 2. Measuring Risk:

The second step after identifying risks is measuring them. Each type of risk should be studied in terms of its magnitude, duration, and likelihood of occurrence. Timing is crucial for risk management.

## 3. Controlling Risks:

There are three basic methods for controlling risks: avoiding certain activities, reducing risks, or eliminating the impact of these risks.

## 4. Monitoring Risks:

Establishing monitoring and control systems for loan risks, interest rates, exchange rates, liquidity, and settlement, which define the boundaries and allocate resources compatible with operational and legal risk control

(Hindi, . Commercial bank management, introduction to decision making -, (2005-p214)

### **2-6- Risk Mitigation Procedures:**

Risk mitigation procedures are mechanisms and administrative arrangements aimed at protecting the assets and profits of the bank by minimizing the chances of losses to the lowest possible extent. Therefore, risk mitigation procedures involve identifying the nature of these risks, measuring and evaluating the possibility of their occurrence, preparing control systems capable of monitoring them before their occurrence or reducing their effects to the minimum extent possible, and determining the required funding to face these losses if they occur, ensuring the bank's continued operations.

These procedures are based on three principles:

1. Selectivity: Choosing at least several debts with minimal risk.
2. Setting a Limit to Risk: Depending on the type and category of the loan.
3. Diversification: Avoiding loan concentration among specific clients.

### **Risk mitigation procedures are divided into two types:**

1. Remedial Approach: This involves all policies and procedures that the bank employs to deal with loan risk after it occurs or when the likelihood of its occurrence becomes very high. This approach is described as remedial because its policies and procedures are implemented at the critical stage of loan risk development or during its occurrence. It falls under the jurisdiction of a specialized department within the bank, such as the Disputes and Legal Affairs Department. The remedial approach utilizes methods and techniques such as converting loans into secured assets.

2- Preventive Approach: This appears in the suitable guarantees taken into consideration by the bank before and during the decision-making process of granting loans, including client diversity and risk sharing among banks, among others

)Akour. (2010-p32))

## **2-7- Major Applications of Artificial Intelligence in Banking:**

### **2-7-1- Anti-Money Laundering (AML):**

Anti-money laundering refers to a set of measures, laws, or regulations designed to prevent the generation of income through illegal means. Money launderers often conceal their activities through a series of steps that make funds from illegal or unethical sources appear legitimate. Many banks, especially large ones worldwide, are transitioning from rule-based software systems to artificial intelligence-based systems, which are more powerful and intelligent in combating money laundering in the coming years. These systems are being designed to become more flexible, accurate, and faster with continuous innovations and improvements in the field of artificial intelligence (D-Mangani, 2017)

### **2-7-2- Chatbots:**

Financial institutions use "chatbot" applications as customer service agents, typically integrated with popular instant messaging platforms like Facebook Messenger, WhatsApp, and others. Chatbots have advanced features to effectively handle customer inquiries sent via electronic platforms. These applications can directly connect customers to the responsible person who can quickly find suitable solutions for their problems and deal with their issues immediately and directly. Some banks are currently conducting extensive tests to determine the extent of the role of chatbots according to their customers' needs

(Sharaf, (2019\6).) <https://www.whateverict.com/article.php?>

### **2-7-3- Fraud Detection:**

Fraud detection is one of the fields that has received significant support in providing accurate and superior results with the intervention of artificial intelligence. It is a major area in the banking sector where AI systems have emerged prominently. One example is the successful application of data analysis techniques in the banking sector, such as the Falcon-Fico fraud assessment system, which relies on a neural network to deploy advanced artificial intelligence-based systems based on deep learning

(D-Mangani, 2017)

### **2-7-4- Analytics:**

AI-based analytics test vast amounts of data to identify behaviors, clusters, and relationships, allowing the industry to move from mere descriptive analysis to real-time prediction. Machine learning can improve operations such as risk modeling, identity recognition, fraud detection, or credit assurance.

### **2-7-5- Report Generation:**

Natural language can be transformed into prose, and reports and summaries can be written by compiling large amounts of structured data into paragraph form to highlight key points.

### **2-7-6- Robotic Process Automation (RPA):**

RPA uses various technologies to automatically and repeatedly replicate routine human activities with greater accuracy. It uses inputs (either paper-based or digital), examines these inputs, applies rules to them, and then sends the outputs to the next step in the process. JPMorgan has invested in this technology, known as COIN, which analyzes legal documents and extracts important data points and phrases much faster than humans. (Singapore, 2018)

### **2-7-7- Microsoft Power BI:**

One of the best AI tools for data analysis is Microsoft Power BI, an extremely useful business intelligence platform that enables users to sort and visualize their data to gain insights. The underlying system allows users to import data from almost any source and start creating reports and dashboards immediately.

### **2-7-8- Polymer:**

Another option for data analysts is Polymer, a powerful AI tool that provides strong artificial intelligence to transform data into a simplified, flexible, and robust database. Like other excellent AI tools, one of Polymer's best aspects is that it does not require any coding. The tool relies on artificial intelligence to analyze data and improve users' understanding of it. Polymer achieves all this without the need for lengthy setup processes. All the user needs to do is upload their data table to the core system to instantly convert it into a simplified database that can then be explored for insights.

### **2-7-9- Algorithmic Trading:**

Algorithmic trading occurs when you use computer codes and programs to open and close trades based on predetermined rules such as price movement points in the underlying market. Once the current market conditions match any pre-specified criteria, trading algorithms (algos) can execute buy or sell orders on your behalf—saving you time from manually scanning markets. You can trade with algorithms through designated partners using advanced modern platforms including ProRealTime and MetaTrader (MT4), in addition to our custom application programming interfaces (APIs). We also provide advanced tools for technical analysis and charting to make algorithmic trading easy for you, whether you want to fully build and modify your algorithms or use ready-made solutions. (Brummer, 2019)

## **2-8- Requirements for Successful Implementation of Artificial Intelligence in Banking**

According to Accenture, there are three immediate actions to leverage artificial intelligence:

2-8-1- Ensuring a well-defined strategy for data usage and application, along with analyzing how data is used, while agreeing on the role that AI tools can play in building value for employee and customer data.

2-8-2- Establishing and developing an "AI Center of Excellence" that can provide centralized capability applicable across the organization. This may include external resources that can provide flexibility and speed of implementation.

2-8-3- Creating a conducive environment for experimentation and learning that can explore AI processes and banking operations, increasing innovation speed. (Marous J, 2017)

2-9- Obstacles to Implementing Artificial Intelligence in Banking:

There are five main challenges to maximizing the benefits of AI and ensuring risk mitigation. (Kleinman, . (2018).)

#### 2-9-1- Agreement on the Nature of Artificial Intelligence:

It took the European Parliament two years to come up with a definition for artificial intelligence, which is a program "fed with a certain set of goals, set by humans, to produce outputs like content, predictions, recommendations, or decisions that influence environments it interacts with."

There will be a vote on the AI law, the first of its kind governing artificial intelligence, which goes beyond optional regulatory rules and requires companies to comply with them.

#### 2-9-2- Global Agreement:

Sanaa Gharaghani, former head of the British AI Office, points out that technology knows no borders. She told BBC News: "We need international cooperation on this issue, I know it will be difficult. It's not a local issue. These technologies don't fall within the scope of a single country." There is still a plan for a global AI regulatory body akin to the United Nations, although some have different ideas:

- EU proposals are the strictest, including classifying AI products based on their impact. For example, a candidate or unwanted email filter would have lighter regulatory restrictions than a cancer detection tool.
- The UK is incorporating AI regulatory rules into existing regulatory bodies. For example, those complaining that technology may have discriminated against them should go to the Equality Committee.
- The US has only optional regulatory rules, with lawmakers at a recent AI-focused hearing acknowledging concerns about the validity of those rules.
- China plans to require companies to notify users when using AI algorithms.

#### 2-9-3- Ensuring Public Trust:

Jean-Marc Leclerc, head of regulatory and government affairs at IBM, says, "If people trust it, they will use it."

There are immense opportunities for AI to improve people's lives in unimaginable ways. It can:

- Help discover antibiotics.
- Assist paralyzed individuals in walking again.
- Address issues like climate change and epidemics.

But what about screening job applicants or predicting the likelihood of someone committing a crime?

The European Parliament wants to inform the public about the risks associated with each AI product.

Companies that violate their rules can be fined more than €30 million or 6% of their global annual sales.

But can AI developers predict or control how their products are used?!

You can bet they want to get as close as possible to the legislators responsible for setting regulations.

Baroness Lane Fox, founder of Lastminute.com, stressed the importance of involving non-companies. "Civil society, academic circles, and those affected by these models and various transformations should be involved."

#### 2-9-4- Identifying Rule Setters:

So far, artificial intelligence has largely controlled itself.

Large companies say they comply with "crucial" government regulations to mitigate potential risks, according to Sam Altman, CEO of OpenAI, the company behind the chatbot "Chat GPT." But will companies profit from people's engagement in writing regulatory rules?

You can bet they want to get as close as possible to the legislators responsible for setting regulations.

And Baroness Lane Fox, founder of Lastminute.com, stressed the importance of involving non-companies.

"Civil society, academic circles, and those affected by these models and various transformations should be involved."

### **2-9-5- Acting Quickly:**

Microsoft has invested billions of dollars in the chatbot "Chat GPT," hoping to "get rid of hard work." Artificial intelligence can generate rich, human-like textual responses, but, as Altman points out, it's "a tool, not a creature." Chatbots can make workers more productive in their jobs. In some industries, AI can create more jobs and play a huge collaborative role. But others have already lost out; last month, BT announced that AI would replace 10,000 jobs.

"Chat GPT" has been in public use for just over six months.

(Kleinman P. W.-Z., (June 2023))

Riyad Zarrouki sees other challenges facing the application of artificial intelligence, among the most prominent being: (Riad Zerrougui - Falta, 2020-p7))

1. Shortage of AI-specialized personnel.
2. Insufficient infrastructure technology.
3. High financial costs required for AI implementation.
4. The need for virus detection programs and continuous updating.

### **2-10- Negatives of Artificial Intelligence in the Banking Sector:**

The adaptation of artificial intelligence in the banking sector comes with some associated drawbacks, which can be highlighted as follows: (Alzaidi, 2018)

Full automation of banking operations contributes to weakening supervision.

1. Weak decision-making ability under specific circumstances.
2. Developing a secure automated environment requires more security protocols.
3. Artificial intelligence will replace humans in the value chain, performing tasks currently done by humans faster and more accurately, leading to many redundant employees, thus contributing to increased unemployment rates.

### **Applied Study**

Continuing from the theoretical study presented earlier and in line with the research objectives of elucidating the impact of using artificial intelligence techniques in mitigating banking risks, as well as highlighting the main obstacles hindering the application of artificial intelligence techniques in commercial banks, and aiming to practically test the research hypothesis, the applied study will involve translating the concepts of artificial intelligence techniques into mitigating banking risks and implementing them in order to clarify the impact of using artificial intelligence

techniques in reducing banking risks. The study also aims to address the posed problem and verify the validity of the hypothesis through the use of the SPSS program and the Alpha Cronbach scale to check the reliability and validity of the questionnaire.

**3-1 Study Sample:**

The study population consists of employees in the banking administration and financial management managers at Al-Rajhi and Al-Ahli banks. To complete this study, a questionnaire was distributed to study the impact of using artificial intelligence techniques in mitigating banking risks. Forty questionnaires were distributed to all members of the sample, and all questionnaires were returned. The questionnaire consists of two main sections. The first section includes variables related to general information about the study sample of employees (age, educational level, job nature, years of experience, number of training courses). The second section of the questionnaire includes the basic variables of the study, consisting of three axes and 27 statements distributed across the three main axes, namely:

1. Axis One: Identifying the current use of artificial intelligence techniques in banking operations.
2. Axis Two: Assessing the significant impact of applying artificial intelligence techniques in commercial banks on mitigating banking risks.
3. Axis Three: Identifying the main obstacles to implementing specific artificial intelligence techniques in banking operations.

To verify the reliability and validity of the questionnaire, the Alpha Cronbach scale was used. The stability of the questionnaire refers to its ability to give the same result if redistributed multiple times under the same conditions. The Chi-square test was used to determine the significance of the correlations between the calculated variables, and the results were as follows:

The questionnaire stability test calculated the Cronbach's Alpha coefficient for each group of questionnaire sets, and the results averaged 99.6%, indicating a high reliability rate, which highlights the reliability of the questionnaire in testing hypotheses to achieve the study objectives.

**Primary Data:**

1. Age:

Table No. (1) Distribution of simple members by age

From 20 to 30	From 30 to 40	From 40 to 50	more than 50	the age
9	15	10	6	Repetition
22.5%	37.5%	25%	15%	The ratio

Source: Statistical analysis

From the table above (Table 1), we notice that 22.5% of the sample individuals are aged between 18 to 30 years old, while 37.5% of the sample individuals fall within the age range of 30 to 40 years old, which is the highest percentage. Additionally, 25% of the sample individuals are aged between 40 to 50 years old, and 15% of the sample individuals are over 50 years old, which is the lowest percentage. This indicates the presence of young elements and continuous influx of new experiences.

2- Educational level:



Table No. (2) Distribution of sample members by educational level

Less than a diploma	Middle Certification	University	Higher Diploma - Master - Doctorate	Educational level
0	4	24	12	Repetition
0	10%	60%	30%	The ratio

Source: Statistical analysis

From the table above (Table 2), we observe that 60% of the sample individuals have a university degree or equivalent, which is the highest percentage. Additionally, 30% of the sample individuals hold a postgraduate diploma, master's degree, or doctorate, while 10% of the sample individuals have a medium level of education. Furthermore, 0% of the sample individuals have education below a diploma, which is the lowest percentage. This indicates that banks are inclined to recruit qualified scientific personnel to perform their activities.

### 3- Nature of the job

Table No. (3) Distribution of sample members according to job tasks

Artworks	Banking administrative work	Management is top	Job tasks
6	22	12	Repetition
15%	55%	30%	The ratio

Source: Statistical analysis

We notice from the table above (3) that 30% of the sample individuals work in senior management roles, and that 55% of the sample individuals work in banking administrative roles, which is the highest percentage. Additionally, 15% of the sample individuals work in technical roles related to operating, programming, and maintaining devices, which is the lowest percentage."

### 4- Years of Experience

Table No. (4) Distribution of sample members according to years of experience

Less than 5 years	From 5 to 10	From 10 to 15	More than 15	Years of Experience
13	8	4	15	Repetition
0,325	0,2	0,1	0,375	The ratio

Source: Statistical analysis

## Secondly: Study Axes

Testing the First Hypothesis:

First Hypothesis: There is a significant impact of implementing artificial intelligence techniques in commercial banks on reducing the risks of banking operations. Second Hypothesis: There is a reverse relationship between the application of artificial intelligence techniques in commercial banks and keeping up with the progress of global financial and banking operations.

The First Axis: The reality of using artificial intelligence techniques in banking operations.

Table No. (5) Distribution of the sample members' answers according to the reality of using artificial intelligence techniques in banking.

p	Chi-square	standard deviation	Medium	Total	Totally agree	OK	neutral	not agree	Completely disagree	the question	
0,00	21,600	8,42	14,80	40	8	22	4	4	2	r	1
				1	0,2	0,55	0,1	0,1	0,05	%	
0,00	39,250	8,55	15,85	40	6	23	8	1	2	r	2
				1	0,15	0,575	0,2	0,025	0,05	%	
0,00	31,250	7,57	14,25	40	4	21	10	2	3	r	3
				1	0,1	0,525	0,25	0,05	0,075	%	
0,00	47,000	9,97	17,40	40	6	25	5	1	3	r	4
				1	0,15	0,625	0,125	0,025	0,075	%	
0,00	43,250	9,25	16,65	40	8	24	4	1	3	r	5
				1	0,2	0,6	0,1	0,025	0,075	%	
0,00	32,00	7,24	14,40	40	7	21	9	1	2	r	6
				1	0,175	0,525	0,225	0,025	0,05	%	
0,00	44,750	8,96	16,95	40	9	24	4	2	1	r	7
				1	0,225	0,6	0,1	0,05	0,025	%	
0,00	23,400	8,80	15,65	40	8	23	5	2	2	r	8
				1	0,2	0,575	0,125	0,05	0,05	%	
0,00	27,200	9,32	16,60	40	8	24	4	2	2	r	9
				1	0,2	0,6	0,1	0,05	0,05	%	

Source: Statistical analysis

We notice from the above Table (5) that the Chi-square test is significant for all statements constituting the axis of the reality of using artificial intelligence techniques in banking operations. That is, all the calculated Chi-square values are greater than their tabulated values, indicating statistically significant differences in response proportions to the questions on Likert scales. Therefore, we reject the null hypothesis and accept the hypothesis of the existence of a significant correlation between banks employing specialized human resources in artificial intelligence techniques and providing banks with modern programs and technologies, and developing their banking activities.

Referring to the correlation between the hypothesis and the research variables, we can refer to the statistical regression analysis. The previous table shows the results of the regression analysis as follows:

- The p-value = 0.00 for all statements listed under this hypothesis.
- The average values for all statements range from 14.25 to 17.40.

- The Chi-square ( $\chi^2$ ) values indicate a statistically significant correlation between the variables of the hypothesis.

Additionally, the results of the regression analysis show that there is a statistically significant correlation ( $p < 0.05$ ) between the use of artificial intelligence techniques in banks and the improvement of managing banking business risks.

**Axis Two:** There is a significant impact of applying artificial intelligence techniques in commercial banks on reducing banking business risks.

Table No. (6) Distribution of the sample members' answers according to the impact of applying artificial intelligence techniques in reducing banking risks.

p	Chi-square	standard deviation	Medium	Total	Totally agree	OK	neutral	not agree	Completely disagree	the question
0,00	26,600	6,82	13,45	40	8	20	8	3	1	r
				1	0,2	0,5	0,2	0,075	0,025	%
0,00	17,600	6,68	14,20	40	12	20	2	4	2	r
				1	0,3	0,5	0,05	0,1	0,05	%
0,00	18,250	5,97	11,65	40	7	18	8	5	2	r
				1	0,175	0,45	0,2	0,125	0,05	%
0,00	30,00	7,69	14,00	40	5	21	9	3	2	r
				1	0,125	0,525	0,225	0,075	0,05	%
0,00	38,00	6,71	15,60	40	13	21	3	1	2	r
				1	0,325	0,525	0,075	0,025	0,05	%
0,00	41,750	9,57	16,35	40	7	24	4	2	3	r
				1	0,175	0,6	0,1	0,05	0,075	%
0,00	27,500	8,05	13,50	40	5	21	7	4	3	r
				1	0,125	0,525	0,175	0,1	0,075	%
19,000	5,19	11,80	40	40	11	17	2	7	3	r
				1	0,275	0,425	0,05	0,175	0,075	%
0,00	37,750	8,92	15,55	40	8	23	4	3	2	r
				1	0,2	0,575	0,1	0,075	0,05	%

Source: Statistical analysis

We notice from the table above (6) that the Chi-square test is significant for all the statements comprising the axis of the actual impact of applying artificial intelligence techniques in reducing banking business risks. This indicates statistically significant differences in response rates to questions related to the second axis according to Likert scales. Therefore, we reject the null hypothesis and accept the hypothesis of the existence of a significant correlation. In other words, there is a significant correlation between the application of artificial intelligence techniques and the reduction of banking business risks. Thus, we accept the hypothesis that there is a significant impact of applying artificial intelligence techniques in commercial banks on reducing banking business risks.

Referring to the relationship between the hypothesis and the research variables, we can refer to the statistical regression analysis. The previous table shows the results of the regression analysis as follows:

- The p-value = 0.00 for all the statements listed under this hypothesis.
- The average values range from 11.65 to 16.60.
- The Chi-square values ( $\chi^2$ ) indicate a statistically significant correlation between the variables of the hypothesis.

Based on the results of the regression analysis, it appears that there is a statistically significant correlation between the use of artificial intelligence techniques in commercial banks and both the reduction of banking business risks and keeping pace with global financial and banking developments. Therefore, it can be said that the results indicate a positive relationship between the use of artificial intelligence techniques in banks and improving the level of banking business risk management and keeping up with global developments in the financial and banking sector.

**The third axis:** Major obstacles to the application of artificial intelligence techniques in banking operations.

Table No. (7) Distribution of the sample members’ answers according to the obstacles to applying special artificial intelligence techniques in banking.

p	Chi-square	standard deviation	Medium	Total	Totally agree	OK	neutral	not agree	Completely disagree	the question	
0,08	6,600	5,51	10,85	40	17	7	8	4	4	r	1
				1	0,425	0,175	0,2	0,1	0,1	%	
0,00	17,00	5,30	11,15	40	17	8	5	2	8	r	2
				1	0,425	0,2	0,125	0,05	0,2	%	
0,00	23,250	6,51	12,65	40	10	19	4	5	2	r	3
				1	0,25	0,475	0,1	0,125	0,05	%	
0,03	10,500	4,19	10,10	40	15	9	5	8	3	r	4
				1	0,375	0,225	0,125	0,2	0,075	%	
0,00	39,500	8,58	15,90	40	9	23	3	4	1	r	5
				1	0,225	0,575	0,075	0,1	0,025	%	
0,00	22,600	9,16	12,52	40	9	17	9	3	2	r	6
				1	0,225	0,425	0,225	0,075	0,05	%	
0,06	7,200	4,91	11,35	40	16	6	12	3	3	r	7
				1	0,4	0,15	0,3	0,075	0,075	%	
0,05	9,250	3,67	9,85	40	14	5	8	10	3	r	8
				1	0,35	0,125	0,2	0,25	0,075	%	
0,03	8,600	3,02	8,95	40	5	13	8	8	6	r	9
				1	0,125	0,325	0,2	0,2	0,15	%	

Source: Statistical analysis

We notice from Table (7) above that the chi-square test is not significant for all the statements forming the axis of obstacles to the application of artificial intelligence techniques in banking operations. This indicates that there are no statistically significant differences in response rates to the questions according to the five-point Likert scale. It means that there are indeed obstacles to the application of artificial intelligence techniques in banking operations, but these obstacles can be easily addressed, and their impact on the application of such techniques is minimal.

Since the chi-square test is significant for all the statements forming the three axes of the study, this indicates that there are statistically significant differences in response rates to the questions according to the five-point Likert scale. Therefore, we reject the null hypotheses and accept the positive hypotheses, meaning that there is a statistically significant relationship between the application of artificial intelligence techniques in commercial banks and the reduction of banking business risks.

## Results and Recommendations

### Firstly - Results:

1. There are numerous artificial intelligence techniques used in commercial banks.

2. Artificial intelligence techniques significantly contribute to facilitating banking operations, data analysis, international communications, and reducing risks such as money laundering, fraud, and cheating.
3. There is a statistically significant relationship between the application of artificial intelligence techniques and the reduction of banking business risks.
4. Commercial banks are keeping pace with technological advancements and working to bridge the gap between themselves and the rapid developments in artificial intelligence.
5. Commercial banks strive to attract and employ highly skilled human resources to ensure the achievement of their goals and strategic objectives.
6. Commercial banks possess modern technologies and some artificial intelligence techniques.
7. Implementing artificial intelligence techniques has become essential in the banking sector due to the international and local environment operating within this framework and to keep up with global advancements in this field.
8. The use of artificial intelligence applications is not without risks and obstacles that hinder their optimal implementation, but with the advancement in digital applications, they can be easily overcome.

### **Secondly - Recommendations:**

1. Work on improving the infrastructure for artificial intelligence technologies in financial institutions.
2. Artificial intelligence is the key to achieving efficiency and effectiveness in banking operations.
3. Pay attention to the process of training employees on the use of artificial intelligence applications.
4. Encourage scientific research in the field of artificial intelligence and its applications for governing artificial intelligence and its applications, as well as the ethics of those systems.

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