

# Artificial Intelligence Between Theory And Applicability In Islamic Banks

ROKIA HADDADOU<sup>1</sup>, FATMA BOUDERRA<sup>2</sup>, LYND AIT BACHIR<sup>3</sup>

<sup>1,2,3</sup>University Center Aflou-El Cherif Bouchoucha-, Legal and economic studies laboratory (Algeria).

The Author's E-mail: [r.haddadou@cu-aflou.edu.dz](mailto:r.haddadou@cu-aflou.edu.dz)<sup>1</sup>, [f.bouderra@cu-aflou.edu.dz](mailto:f.bouderra@cu-aflou.edu.dz)<sup>2</sup>,  
[l.ait\\_bachir@cu-aflou.edu.dz](mailto:l.ait_bachir@cu-aflou.edu.dz)<sup>3</sup>

Received: 09/2023

Published: 05/2024

## Abstract:

As a result of the COVID-19 pandemic, digital development has emerged as one of the most important pillars for the future of the banking and financial industry, as clients increasingly want to do their banking via electronic applications and intelligent solutions. Within this framework, AI holds great promise for disrupting the current structure of traditional financial services. It saves time and money. The purpose of our research is to investigate the potential for AI applications in Islamic banks and to provide a theoretical and technological definition of artificial intelligence. According to the results of the research, Islamic banks may boost their competitiveness, operational efficiency, and income by heavily using augmented AI.

**Keywords:** Intelligence; artificial; banks; Islamic.

## 1. Introduction

In the last ten years, the world of international business has seen tremendous and quick transformations, with digital technology playing a significant role. With the emergence of new possibilities to build a new model for economic and social progress, markets, industries, and enterprises have been transformed or shaken up. Although the COVID-19 epidemic has had a major effect on people and communities all across the globe, it has also helped push digital technology into the mainstream. The shift towards digitalisation is anticipated to persist, and the digital transformation is seen as methodical and lasting.

Artificial intelligence (AI) models are quickly improving and becoming more understood; these advancements have numerous practical applications in business. There will likely be huge colossal and fast change in the financial services sector as a result of AI. Whether it's by assisting clients in making more informed financial decisions or by raising their capital through investments, financial institutions on a global and local scale are always looking for new and creative methods to boost their revenue.

A number of factors are propelling the artificial intelligence (AI) banking industry forward, including the rising popularity of customer-centric services, the proliferation of banking applications, the need for AI systems to identify fraud, and the need for easier online and mobile banking. The sector's ambitions will be expedited by the rise of artificial intelligence. Reports from the OpenText Survey indicate that almost 80% of banks throughout the globe are aware of the ways in which artificial intelligence (AI) may improve the banking experience for customers and boost revenue.

In light of these opportunities, we present our main research inquiry: What artificial intelligence applications are Islamic banks planning to implement?

To address the main research inquiry, we posit the following hypotheses:

- The process of implementing and executing artificial intelligence in Islamic banks involves crucial stages such as awareness dissemination, experience evaluation, impact assessment, and application of AI in Islamic banking.
- Identifying the strategy for adopting an AI approach in Islamic banks over the long term.

To answer the main research inquiry through the following axes:

- The first axis: The theoretical framework of artificial intelligence.
- The second axis: The technical framework of artificial intelligence.
- The third axis: Growth and structuring of the AI banking market.
- The fourth axis: Implementable AI applications in Islamic banks.

## **2-The theoretical framework of artificial intelligence**

Artificial intelligence is a term agreed upon for the type of intelligence that a mute machine can acquire by implanting it with programs and algorithms that make it appear as though it possesses a mind mimicking human mental capacities in various patterns, thus making that machine behave as if it were a rational human being distinguished by the use of artificial intelligence research. In this sense, artificial intelligence manifests as behaviour and actions with specific characteristics performed by the machine without real awareness from it. However, this behaviour results from equipping the machine with certain capabilities, such as the ability to learn, infer, and evaluate reactions through dedicated software and algorithms, whose task is to provide the machine with those capabilities, eliminating the need to program and store all possible responses and reactions in advance in the computer program responsible for operating this machine.

### **2.1 Intelligence**

The term intelligence is associated with the capacity for understanding; however, in the scientific arena, where disciplines are diverse and branched, it is difficult to find a unified definition of the term intelligence that is agreed upon by academic researchers. For example, the concept of intelligence among philosophers is based on the acquisition of ideas, their preservation, transformation, and transmission. In contrast, among psychologists, it has been linked to the human brain and its behaviour, where intelligence is generated as a result of an individual's adaptation to their environment. Intelligence has been divided into functional intelligence and studied intelligence. Additionally, another concept of intelligence, termed intellectual quotient, has been established through a series of tests involving logic, memory, reasoning, and more<sup>1</sup>.

### **2.2 Artificial Intelligence**

Before providing a specific concept on which the science of artificial intelligence is based, it is worth noting that the fundamental principle underlying the field of artificial intelligence does not lie in solving problems faster, processing more data, or storing a larger

amount of information that the human mind retrieves. Rather, the more accurate principle upon which this field is built is indeed the principle of processing information, regardless of its nature and size, in an automatic or semi-automatic (user intervention) manner, appropriately and in accordance with a specific goal.<sup>2</sup> Given the novelty of this subject, it is not surprising that there is disagreement among various researchers and experts in defining its concept and essence. Table number 01 below presents some of the prominent definitions provided for the concept of artificial intelligence.

Table 01: Concept of Artificial Intelligence According to Various Researchers

Researcher	Proposed Definition
Bellman, 1978	Automation of human cognitive activities such as decision-making, problem-solving, learning, etc. <sup>3</sup>
Rich and Knight, 1991	Studying how to make computers perform tasks better than humans. <sup>4</sup>
Winston, 1992	Study of computers enabling perception, thinking, and behaviour. <sup>5</sup>
Shapiro, 1992	The branch of science and engineering is concerned with understanding the so-called behaviour of intelligence and working to embody this behaviour artificially. <sup>6</sup>
El Hadi, 1993	The science of designing powerful computer programs to make them more useful and intelligent. <sup>7</sup>
Simon, 1995	A branch of computer science associated with other sciences like psychology and knowledge aims to make computers perform tasks efficiently that simulate human capabilities and strive to make them think intelligently. <sup>8</sup>
John McCarthy, 2004	It is the science and engineering of making intelligent machines and intelligent computer programs. It is associated with the similar task of using computer devices to understand human intelligence, but AI should not be limited to methods observable biologically.
Negnevitsky, 2005	The behaviour of a device that, if done by a human, would be considered intelligent. <sup>9</sup>
Adel, 2005	Science deals with simulating the computer and the intelligence processes that occur within the human mind. <sup>10</sup>
Luger, 2009	A branch of computer science concerned with automating human behavior. <sup>11</sup>
Al-Lawzi, 2012	A field of science and technology based on sciences such as computer science, biology, psychology, linguistics, mathematics, and engineering. The aim is to provide computational machines capable of thinking, vision, hearing, walking, speaking, and sensing. <sup>12</sup>
Buchanan, 2019	Computer devices and systems are designed to operate in a way that can be considered intelligent. <sup>13</sup>
Mhlanga,	It is the capacity of the computer to mimic the mental processes and workflow

Researcher	Proposed Definition
2020	of a human being, including reasoning, learning from mistakes, and making new discoveries. <sup>14</sup>
Al-Sartawi, 2020	Computer programs that can learn and draw their own conclusions from complicated information, have natural conversations with people, and improve people's cognitive abilities are all part of this category. <sup>15</sup>

**Source:** Prepared by the researchers based on previous studies.

The two primary ways in which prior AI concepts vary are in their emphasis on thinking and inference processes. The effectiveness of AI is evaluated along the first dimension, which takes human performance into account. In order to gauge AI performance, the second dimension makes use of a rationality scale. In a nutshell, AI is the study of problem-solving via the integration of computer science and large datasets. Machine learning and deep learning are subfields of artificial intelligence that are often referenced along with this discipline. Expert systems that can analyze data and provide predictions or categorizations are the result of these areas of artificial intelligence algorithm development.

### 2.3 The Evolution of Artificial Intelligence

The concept of 'thinking machines' dates back to ancient Greece. However, the emergence of electronic computing marked significant milestones in the development of artificial intelligence (AI), as follows<sup>16</sup>:

- **1950:** Alan Turing publishes an article on "Computing Machinery and Intelligence," proposing an answer to the question "Can machines think?" and introducing the Turing Test to determine if a computer can exhibit the same intelligence (or intelligence results) as humans. Since then, AI system design teams everywhere have been inspired by the idea of striving to develop computer systems that interact in natural and somewhat human-like ways.
- **1956:** At the first AI conference held at Dartmouth College, the phrase "artificial intelligence" was first used by John McCarthy. (McCarthy later built the Lisp programming language.) 'Logic Theorist,' the first artificial intelligence software, was created that year by Allen Newell, J.C. Shaw, and Herbert Simon.
- **1964:** Joseph Weizenbaum, a professor at the Massachusetts Institute of Technology, developed ELIZA, an interactive program capable of conducting conversations in English on any topic.
- **1967:** The first computer to use a neural network that "learned" by trial and error was the Mark 1 Perceptron, which Frank Rosenblatt constructed. Marvin Minsky and Seymour Papert's "Perceptrons" was a seminal work on neural networks and, for a while, a case against further neural network research initiatives; it was released only a year after that.
- **1980:** A large number of artificial intelligence applications made use of neural networks that self-trained using the backpropagation technique. The development of expert systems began.

- **1997:** IBM's Deep Blue computer defeated then-world chess champion Garry Kasparov in a chess match (and the rematch).
  - **2011:** IBM Watson outperformed champions Ken Jennings and Brad Rutter in the Jeopardy! Challenge.
  - **2014:** Google acquired DeepMind for \$400 million, aiming to advance probabilistic thinking, machine learning, and big data.
  - **2015:** Baidu's Minwa supercomputer utilized a special type of deep neural network called convolutional neural networks to recognize and classify images more accurately than an average human.
  - **2016:** The development of DeepMind's AlphaGo program, powered by deep neural networks, surpassed Lee Sedol, the world champion Go player.
  - **2019:** OpenAI's team defeated a team of five professionals in the video game Dota 2, a complex real-time strategy game with an immense number of possible moves, after more than 14.5 trillion moves.
- Today, AI applications extend beyond gaming, encompassing natural language processing, computer vision, and predictive modelling.

### 3. The technical framework of artificial intelligence

In this section, we aim to explore the various branches and applications of artificial intelligence.

#### 3.1 Types of Artificial Intelligence:

Intelligence has been classified into three types:<sup>17</sup>

**Narrow Artificial Intelligence (ANI)**, also known as Weak AI, is artificial intelligence that is trained and focused on performing specific tasks. Most of the artificial intelligence surrounding us today falls under narrow artificial intelligence. The term 'narrow' might be a more accurate descriptor for this type of artificial intelligence because it is not weak; it enables highly powerful applications such as Apple's Siri, Amazon's Alexa, IBM Watson, and autonomous vehicles.

**General Artificial Intelligence (AGI)** is a theoretical branch of AI in which computers are theoretically capable of cognitive abilities comparable to those of humans. In addition to becoming self-aware, they would be capable of learning new things, solving problems, and making plans for the future. Despite the fact that AI in general is still in its infancy and has no real-world applications, experts in the field are still investigating potential avenues for advancement.

**Artificial Superintelligence (ASI)**, also known as Superintelligence, would surpass human brain intelligence and capability. Meanwhile, the best examples of ASI might be found in science fiction, such as HAL, the supercomputer assistant in 2001: A Space Odyssey.

### 3.2 Levels of Artificial Intelligence

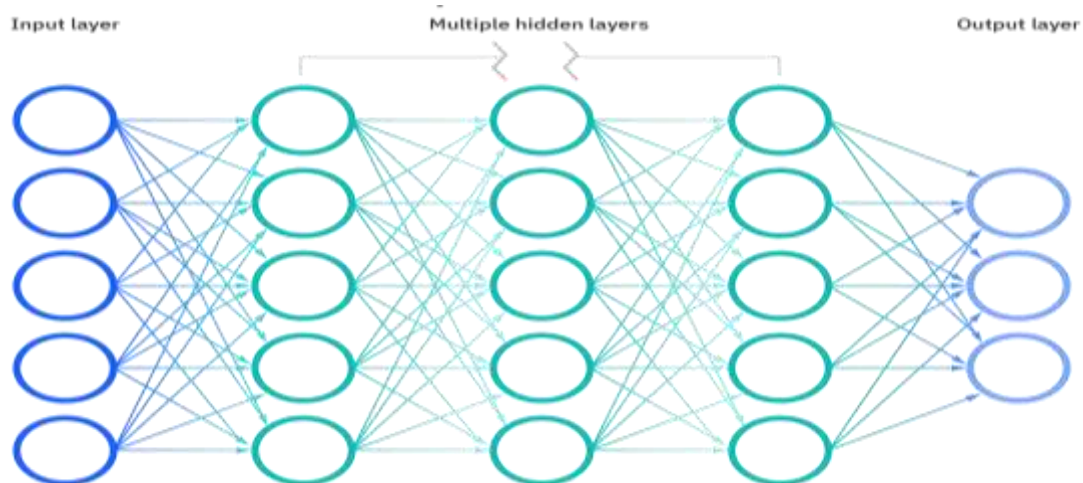
There are subtle distinctions between Deep Learning and Machine Learning, two branches of AI. Actually, machine learning includes deep learning as one of its subsets.

How these algorithms learn is where deep learning and machine learning diverge. More human oversight is required for learning in traditional, or "non-deep," machine learning. In order to learn from data that is not already structured, human experts must first establish a hierarchical sequence of characteristics that allow them to distinguish between different types of inputs. There are three main categories of machine learning applications<sup>18</sup>:

- **Supervised learning:** A function linking one input to one output by recognizing patterns evident in existing input-output examples. This type of learning infers a function through categorized training data consisting of a set of training examples. It is the most commonly used and also has the most practical applications to date.
- **Unsupervised learning:** Algorithms that use machine learning to extract inferential insights from datasets consisting of input data without classified responses.
- **Reinforcement learning:** It involves how software behaves in a certain environment to enhance the concept of cumulative reward. In recent years, reinforcement learning has witnessed rapid growth.

However, **deep learning** automates a considerable portion of feature extraction, which allows for the usage of bigger datasets and reduces the need for human interaction. Scalable machine learning is what deep learning is all about. Deep learning algorithms rely on neural networks as their foundation. To be classified as a deep learning method, a neural network must have more than three layers (including inputs and outputs), which is also known as the depth of the network. In contrast, a single neural network does not have to have more than one layer. This is the most common way to depict them visually:

Figure 1: Deep Learning



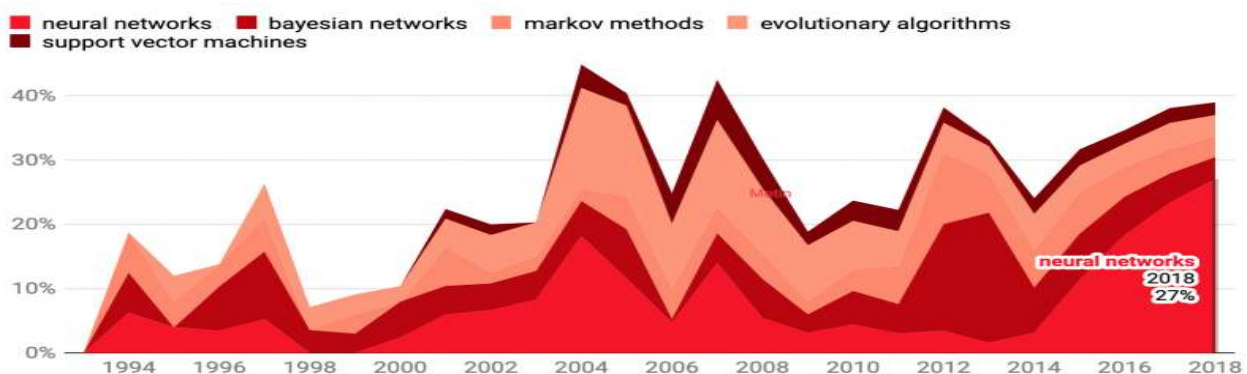
**Source:** Cem Dilmegani,(2017), Dark side of neural networks explained, from site : AIMultiple: <https://research.aimultiple.com/how-neural-networks-work/>

Machine learning often makes use of ANNs, or **artificial neural networks**, which are models of the brain's actual neural network architecture. The artificial neurons that make up these networks are linked with one another. Neurons take in information, analyze it using a specified mathematical function, and then send the results back out to other neurons.

Artificial Neural Networks (ANNs) can be classified into three main layers: input, hidden, and output layers. These layers work together to process input data and generate accurate outputs. Within these layers, the parameters connecting individual neurons are computed based on the provided input data. Data scientists leverage ANNs for various applications such as decision-making, enhancing predictive models, image recognition, and robotics. ANNs come in different architectures, including shallow and deep networks, each with its unique structure and capabilities.

The 1950s and 1960s saw a lot of study on **shallow and deep networks**, but these models couldn't handle complicated tasks when it came time to learn them. Back then, basic logical operations couldn't be learned by a single layer of receptors (neurons). Research on deep networks was mostly confined to shallow ANNs due to machines' inadequacy in training them. As affordable CPUs and GPUs were widely available in 2010, researchers were able to train deep networks in realistic amounts of time. Ever since then, deep ANNs have been the center of attention in the field of artificial intelligence. As you can see in the figure below, neural networks have surpassed all other AI research topics since 2015.

Figure 02: Evolution of Proportions of Machine Learning Methods



Source: MIT Technology Review,(2019),

<https://www.technologyreview.com/2019/01/25/1436/we-analyzed-16625-papers-to-figure-out-where-ai-is-headed-next>

### Artificial Neural Network Architectures:

There are a number of different ways to build deep networks. We provide a few of the most popular designs below<sup>19</sup>:

**Responsive Neural Networks (RNNs):** In order to process sequences of inputs, recurrent neural networks (RNNs) use the same weights for each input iteration. When compared to other existing approaches, RNNs perform very well in NLP tasks that depend on historical inputs for prediction. As an example, they were relied upon by Android for text-to-speech conversion in 2015.

A specialized linear operation, convolution is the building block of **convolutional neural networks**. Neural networks that use convolution in a single layer as opposed to standard matrix multiplication are known as convolutional networks. A convolutional neural network design is used, for instance, when you tag someone in a Facebook picture.

**Capsule networks** are an attempt to create a computer system that functions similarly to the brain. Each of these networks is made up of a capsule that houses a cluster of neurons. Capsules function in tandem, with each brain cell handling a distinct characteristic. Because of this, capsule networks may execute jobs simultaneously. Compared to earlier AI algorithms, capsule networks have a 45% reduced error rate.

A heuristic method that uses the idea of natural selection to quickly produce predicted outcomes is **evolutionary algorithms**. Use it for challenging tasks that could take a while to comprehend thoroughly. These days, you can usually discover a good beginning point for another algorithm by using them in tandem with other approaches.

### 3.3 Divisions of Artificial Intelligence

Artificial intelligence can be divided into three layers<sup>20</sup>:

- Bayesian inference, evolutionary computation, and Artificial Neural Networks (ANNs) are algorithms that allow automated decision-making. ANNs are categorized according to their structure (the way nodes are linked) and depth (the number of layers). Deep neural networks, sometimes called deep learning, have been the engine that has propelled AI's most recent innovations.
- Technologies for processing data that these algorithms require: The rise of AI, particularly deep learning, has been driven by improvements in computer power since 2010, which is the foundation of AI.
  - Use these algorithms in certain fields, such as NLP, computer vision, machine vision, reinforcement learning, and transfer learning.

### 4. Growth and Structuring of the Banking Artificial Intelligence Market

The global value of artificial intelligence in the banking market was estimated at approximately USD 3.88 billion in 2020 and is expected to reach USD 64.03 billion by 2030, with a compound annual growth rate of 32.6% from 2021 to 2030.<sup>21</sup> The COVID-19 pandemic has positively impacted the growth rate of artificial intelligence in the banking market, primarily due to:

- A surge in digital transactions during the pandemic led to a 40% increase in demand for advanced AI technology, which helped alleviate the strain on banking servers and minimized transaction delays.
- AI has the ability to manage banking and financial institution operations across the risk management spectrum, including risk identification, measurement, estimation, and impact assessment. An increase in the growth of AI in banking market revenues can be attributed to the heavy investment in AI technology by major financial institutions like Bank of America, JPMorgan, and Morgan Stanley. These institutions are working on automated investment advisors and training systems to detect money laundering techniques.
- -A positive impact of artificial intelligence and data science on technologies that support remote work among employees and on general security by 35%;

- Acceleration in the use of AI-powered tools to manage a sudden increase in customer inquiries; - Artificial intelligence (AI) brings the advantage of digitisation to banks and helps them face the competition imposed by FinTech players, with about 32% of banks already using AI technologies, such as predictive analytics and voice recognition, to gain a competitive edge in the market;
- Cost savings and revenue growth through AI services in the front office (conversational banking and chatbots), back office (credit underwriting), and middle office to assess and analyse anti-fraud;
- Management of vast amounts of data at record speed to derive valuable insights and develop a better understanding of customers and their behaviour; - AI enables banks to customise financial products and services by adding personalised features and intuitive interactions to provide meaningful engagement to customers and build strong relationships with them;
- Increase in customer preferences for personalised financial services due to the rise in adoption of conversational bots among banks and increased competition among banks to gain maximum market share. Customers are able to better manage their finances and reach their financial objectives with the aid of budget management applications driven by AI, which is driving market growth. These applications are offered by many institutions.
- AOne additional new trend in personal finance is robo-advisors, which aim to handle the money of small and medium-sized firms and individuals that don't have a lot of money. Furthermore, AI-powered robo-advisors may leverage conventional data processing methods to build intelligent portfolios that promote market expansion and user-friendly financial solutions like trading, investing, and retirement planning.
- AI in banking is growing because to usage-based loans and other AI technologies that assist determine the right interest rate for each person.

The high expense of deploying AI and advanced machine learning, along with a shortage of trained labor, along with rising security concerns, government regulations, and inadequate trust when it comes to the issuance of customer data, are some of the factors that hinder the expansion of the banking AI market.

The global share of artificial intelligence in the banking market is segmented based on component, organisation size, application, technology, and market players.<sup>22</sup>

**An Analysis of AI in the Financial Sector Broken Down by Component:** Chatbots, customer behavior analytics, CRM, data analytics, fraud detection, and other solutions make up the Solutions segment of the market. The Services segment includes Front Office, Back Office, and Middle Office offerings, such as conversational banking, chatbots, and credit underwriting.

Rising software installations across major, small, and medium-sized banks, as well as burgeoning country demand for AI-based services, will propel the services industry to the forefront of economic growth. The proliferation of FinTech companies providing innovative banking and financial services is another key factor fueling this industry's meteoric rise.

**The Use of AI in the Financial Sector, Broken Down by Company Size:** Sales, revenues, and market share will all be dominated by the massive banking industry. Rising concerns about data and capital protection, more occurrences of online fraud, a greater need for big data analytics, and heightened awareness of the advantages of AI in banking are the

main causes of this trend. Along with the increasing number of checking and savings accounts, major banks have begun to use AI in order to handle loan procedures, credit card monitoring, payment management, complaint tracking, chatbot services, and mobile banking.

**The banking industry's use of artificial intelligence allows for the market to be divided into many submarkets**, including chatbots powered by AI, mobile banking, data collecting and analysis, risk management, and data security. From 2021–2026, the chatbot application industry is projected to see the highest rate of growth. Using chatbots and voice assistants that look and act like real people, global banks use AI on the front end to improve client verification and identification. Some applications of artificial intelligence (AI) have already become commonplace in the banking industry, such as chatbots for customer service and payment fraud detection systems for back-office operations.

**The banking industry makes extensive use of artificial intelligence (AI) technologies** such as machine learning, deep learning, computer vision, big data analytics, risk forecasting and monitoring, chatbots, and natural language processing (NLP). Major banks throughout the globe have included AI into their middle office processes to ward against data theft and online payment fraud, ensuring that the fraud detection industry will see the quickest market growth. Artificial intelligence (AI) also plays a key role in the industry by improving Know Your Customer (KYC) compliance checks and Anti-Money Laundering (AML) activities.

Financial institutions such as Capital One, Citi, HSBC, JPMorgan Chase, Personetics, Quantexa, U.S. Bank, Affectiva, Hooyu, Simudyne, Ayasdi, Socure, DataVisor, ZestFinance, Feedzai, Dataminr, Darktrace, Yodlee, Sift Science, Arago, Callsign, CloudWalk, and Cognicor are among the leading AI firms in the banking industry. These companies have used different approaches to boost their presence in the banking industry's artificial intelligence market and expand their share of the market.

### **5. Practical Applications of Artificial Intelligence in Islamic Banks**

Despite the growth witnessed by the Islamic finance industry in the first half of the last decade, the latter part of the decade saw a slowdown, partly due to the hesitation of Islamic financial institutions to adopt technologies such as machine learning, big data, P2P lending, crowdfunding, smart contracts, cloud computing, Insuretech, and artificial intelligence.

However, Islamic financial institutions have recently embraced artificial intelligence, recognising and adopting this innovation. It is widely accepted by the Islamic finance industry that artificial intelligence is the future, and it would be nearly impossible to maintain steady growth without the extensive use of artificial intelligence and related innovations such as machine learning, artificial neural networks, and big data. As Islamic finance must adhere to strict Sharia compliance, it has further applications in regulatory technology (Regtech) to ensure adherence to Sharia law.<sup>23 24 25</sup>

**Front Office Services Application:** The system uses machine learning and biometric measurements based on customers' facial recognition to enhance the Know Your Customer (KYC) process. This enables Islamic banks and financial institutions to verify customer identity online (e-KYC) by asking customers to take a real-time photo and upload it online using efficient, approved software and functions or to apply biometric signature validation for credit card applications and opening secondary/supplementary accounts. Banks can use

biometric technology to detect fraud. Credit Rating: Artificial intelligence can target individual customers to obtain credit scores based on data obtained from social media platforms like AliPay. Chatbots: Islamic banks such as Dubai Islamic Bank (DIB), which launched EVA in 2016 and the digital banking service Olivia in 2019, and other banks like Abu Dhabi Islamic Bank (ADIB) and Kuwait Finance House use AI-powered and machine learning-enabled chatbots to respond to customer inquiries. Advice-Robo: This has become a prominent factor, especially for online investments and digital trading platforms. Its importance lies in understanding customer needs, gathering customer information, understanding customer preferences, and assessing customer risk tolerance. Financial planning and asset allocation for these plans. Institutional policy implementation, account opening, and asset transfer and conversion. Bahrain Islamic Bank launched "Dana," a virtual employee aimed at simplifying customers' financial dealings and allowing them to conduct their daily transactions with maximum ease and comfort, providing advice on investment matters and financial trends.

**Middle Office Services Application:** Artificial intelligence can be applied in Islamic banking for middle office functions such as risk management, credit underwriting, and credit documentation. Islamic banks and international financial institutions can use 'Robotic Process Automation' (RPA) with available data to monitor credit limits by creating better and faster reports and saving hundreds of work hours. More can be done with fewer human resources and financial resources saved by using RPA technology. JP Morgan Chase applies AI and machine learning to extract 150 different attributes from covenant papers in a fraction of a second compared to 360,000 manual work hours. Emirates NBD has partnered with Amazon Web Services to leverage AI provided by AWS for data analysis, Internet of Things, image recognition, and machine learning capabilities to enhance dealer services.

**Back Office Services Application:** Today, artificial intelligence is seen as the key technology capable of transforming business decision-making through automation by reducing manual processes, increasing efficiency, reducing human error, and enhancing the speed of applications. AI has extensive applications in the back-office processing of Islamic financial institutions. It can be classified into two categories for back-office processing: general processing, like sales order processing, and its application in the insurance industry, such as insurance claims processing. Islamic banks apply AI in back-office operations for asset and wealth management, typical risk management, market impact analysis, approval and processing of banking mortgages, and capital optimisation.

#### **Steps for Implementing Artificial Intelligence Applications in Islamic Banks:**

Islamic banks consider the pros and cons of a broader artificial intelligence (AI) strategy for the institution, and use cases can be beneficial in decision-making. By focusing on ways to generate additional value across a banking institution - from front-office revenue growth to back-office operational efficiencies. The following are the operational steps for a successful, sustainable digital transformation of AI in banking:

- **Step One:** Study the business model and its impact on the institution's returns, customer satisfaction levels, operational costs, etc.
- **Step Two:** The ethical study of the project involves addressing all ethical aspects of the application and Islamic regulations to mitigate any undesirable effects.

- **Step Three:** Study project implementation feasibility based on available technology and institutional requirements.
- **Step Four:** Develop an AI strategy transition from merely using AI capabilities to an AI company and address how to implement it.
- **Step Five:** Identify a value-based use case focusing on existing business value use cases and investing in diverse AI capabilities rather than focusing on limited AI solutions.
- **Step Six:** Test initial models transitioning from concept delivery to laying the foundation and preparing for strategic alignment.
- **Step Seven:** Build trust, transition from a reactive mindset to a proactive focus on risks and ethics, and explore new partnerships with balanced convergence.
- **Step Eight:** Expand the institution's deployment scope by shifting from a "nice-to-have" AI talent list to a "must-have" list and move from rigid technology and operations models to adaptive ones that provide flexibility throughout the institution.
- **Step Nine:** Achieve sustainable results going beyond just AI application to discover how to enhance capabilities and create additional business value from the published application.

The challenges of leveraging AI in Islamic banks lie in achieving prosperity in the future digital economy:

- Achieving a delicate balance between technological innovation and risk mitigation.
- Achieving regulation using better techniques.
- A committee is necessary to oversee the safety of behaviours followed in big data and governance of the automated training model.
- There is a need for much greater international coordination to better leverage entirely new technologies. The need for much greater international coordination to better leverage entirely new technologies.

## 6. Conclusion

Just like the evolution of cloud-based systems in recent years, Islamic banks must move beyond the hype and consider practical applications of artificial intelligence. While there are effective applications, many Islamic banks still view artificial intelligence as experimental, with numerous pilot programs yet to transition to full implementation. Banks must adopt a strategic approach to artificial intelligence and machine learning, investing in a journey of AI application to achieve successful outcomes.

### Study Findings:

- Artificial intelligence systems are reshaping the financial sector, especially in areas like anti-money laundering. Rapid reliance on AI and machine learning in finance leads to gains in efficiency and cost reduction, reshaping financial culture, enhancing predictive accuracy, and improving risk management and compliance.
- The role of artificial intelligence in Islamic finance revolves around making better decisions, enabled by smart systems that can process vast amounts of information and signals beyond human capacity. However, AI's capabilities depend on sustainable sources of high-quality data and optimal data aggregation for efficient processing, pattern recognition, anomaly detection, and prediction.

- Rapid adoption of AI and machine learning in Islamic banking enhances consumer services, offering high-level usage and financial efficiency benefits. Yet, concerns persist, such as result ambiguity, particularly regarding privacy, cybersecurity threats, AI's potential in risk assessment and credit decisions, which could impact financial system safety and stability, as well as political challenges, regulatory trends, and increased interconnectedness leading to amplified financial shocks.
- Widely adopting artificial intelligence and machine learning in Islamic finance enhances the capabilities of regulatory bodies, equipping central banks with new tools for monitoring cash and overall prudential regulations, identifying potential risks and regulatory actions, updating relevant laws and regulations, and expanding consumer education to build AI strategies and national governance frameworks.

**Suggestions:** Based on the foregoing, the following suggestions are proposed:

- Develop information systems in Islamic banks;
- Provide appropriate entry and planning for AI application in Islamic finance;
- Incorporate programming languages into university curricula to prepare future generations for digital roles;
- Engage all relevant public and private entities in developing the technological ecosystem;
- Collaborate and exchange academic and professional knowledge and experiences regionally and internationally;
- Enhance the efficiency of employees in financial institutions for roles AI may play;
- Build customer trust in financial technology tools to contribute to achieving comprehensive goals;
- Adapt financial laws and regulations to technology in financial transactions.

## 7. References

---

<sup>1</sup> Shahmi, Samia, Bay, Mohammed, and Krouche, Haizia. (2018). Artificial Intelligence Between Reality and Aspiration: A Technical and Field Study. Contribution within the International Symposium "Artificial Intelligence: A New Challenge for Law?" Algeria, November 26-27, 2018.

<sup>2</sup> Wisskirchen, G., Biacabe, B. T., Bormann, U., Muntz, A., Niehaus, G., Soler, G. J., & von Brauchitsch, B. (2017). Artificial intelligence and robotics and their impact on the workplace. IBA Global Employment Institute.

<sup>3</sup> Bellman R E, (1978), An introduction to artificial intelligence : can computers think ?, Boyd and Fraser Publishing Company, San Francisco, USA.

<sup>4</sup> Rich E, Knight K, (1991), Artificial intelligence, Mc Graw-Hill, New York, USA.

<sup>5</sup> Winston P H, (1992), Artificial intelligence, 3rd Ed, Addison-Wesley Publishing Company, California, USA.

<sup>6</sup> Shapiro S C, (1992), Encyclopedia of artificial intelligence, 2nd Ed, John Wiley and Sons, Inc, New York, USA.

<sup>7</sup> Hadi, Mohamed Mohamed. (1993). Modern Developments in Computer-Based Information Systems. Dar Al-Shorouk for Publishing and Distribution, Cairo, Egypt.

<sup>8</sup> Simon H A, (1995), Artificial intelligence : an empirical science, Artificial Intelligence, Elsevier, Vol(77), 95-127.

<sup>9</sup> Negnevitsky M, (2005), Artificial intelligence : a guide to intelligent systems, 2nd Ed, Pearson Education, Harlow, England.

- <sup>10</sup> Adel Abdul Noor. (2007). *Fundamentals of Artificial Intelligence*. Dar Al-Faisal Cultural Publishing House, Riyadh, Saudi Arabia
- <sup>11</sup> Luger G F, (2009), *Artificial intelligence : structures and strategies for complex problem solving*, 6th Ed, Pearson Education, Harlow, England.
- <sup>12</sup> Al-Louzi, Mustafa. (2013). *Artificial Intelligence in Business*. Paper presented at the Eleventh Annual Scientific Conference on Business Intelligence and Knowledge Economy, Faculty of Economics and Administrative Sciences, Al-Zaytoonah University of Jordan, Amman, Jordan, April 23-26.
- <sup>13</sup> Buchanan, B.G. (2019): *Artificial intelligence in finance*, Seattle University. Albers School of Business and Economics .
- <sup>14</sup> . Mhlanga, D.(2020) ,*Industry 4.0 in finance: the impact of artificial intelligence (AI) on digital financial inclusion*. *Int. J. Finan. Stud.* 8(45), 1 – 14 .
- <sup>15</sup> Al-Sartawi, A. (2020)◀ *Information technology governance and cybersecurity at the board level*. *Int.J. Crit. Infrastruct.* 16(2), 150 – 161 .
- <sup>15</sup> Ali, M. M., Bashar, A., Rabbani, M. R., & Abdullah, Y. (2020). *Transforming Business Decision Making with Internet of Things ( IoT ) and Machine Learning ( ML )*. 2020 International Conference on Decision Aid Sciences and Application (DASA), Sakheer, Bahrain, 2020, Pp. 674-679, Doi: 10.1109/DASA51403.2020.9317174.
- <sup>16</sup>
- <sup>17</sup> BMI,(2020) , *AI artificial intelligence*, <https://www.ibm.com/sa-ar/cloud/learn/what-is-artificial-intelligence>
- <sup>18</sup> Karen Haoarchive (2019) , **We analyzed 16,625 papers to figure out where AI is headed next**, <https://www.technologyreview.com/2019/01/25/1436/we-analyzed-16625-papers-to-figure-out-where-ai-is-headed-next/>
- <sup>19</sup> N. Saha, A. Swetapadma and M. Mondal, "A Brief Review on Artificial Neural Network: Network Structures and Applications," 2023 9th International Conference on Advanced Computing and Communication Systems (ICACCS), Coimbatore, India, 2023, pp. 1974-1979, doi: 10.1109/ICACCS57279.2023.10112753. keywords: {Performance evaluation;Machine learning algorithms;Neurons;Humanoid robots;Artificial neural networks;Machine Learning;Hardware;ANN;Back-propagation Neural Network;Kohonen Network;Grossberg Network;Long Short-Term Memory Networks;CNN},
- <sup>20</sup> Klaus, Hödl. (2023). *Artificial Intelligence for Decision Making*. doi: 10.59646/edbookc2/009
- <sup>21</sup> Pramod B ◀Shadaab K ◀Vineet K,(2021), *AI in Banking Market* , site <https://www.alliedmarketresearch.com/ai-in-banking-market-A11871>
- <sup>22</sup>Global Market Estimates,(2023), **Global Artificial Intelligence in Banking Market**, <https://www.globalmarketestimates.com/market-report/global-artificial-intelligence-in-banking-market-3295>
- <sup>23</sup> Manoj, Sharma. (2023). *A Study: How AI is Incorporated in the Middle East Banking*. *Journal for Research in Applied Sciences and Biotechnology*, doi: 10.55544/jrasb.2.3.27
- <sup>24</sup> Tayachi, T.; Brahimi, T.; Essafi, Y.; Ben Abdallah, R. *Artificial Intelligence in the Islamic Finance: A bibliometric Analysis*. *Preprints* 2022, 2022110554. <https://doi.org/10.20944/preprints202211.0554.v1>
- <sup>25</sup> Wardah, Yuspin., Kelik, Wardiono., Arief, Budiono., Said, Gulyamov. (2022). *The law alteration on artificial intelligence in reducing Islamic bank's profit and loss sharing risk*. *Legality*, doi: 10.22219/ljih.v30i2.23051