

T.R.
ISTANBUL SABAHATTIN ZAIM UNIVERSITY
GRADUATE EDUCATION INSTITUTE
DEPARTMENT OF ISLAMIC ECONOMICS AND FINANCE

**INTEGRATING ARTIFICIAL INTELLIGENCE IN
MOROCCAN ISLAMIC BANKS:
CHALLENGES AND PROSPECTS**

MA THESIS

Ayman AMMARA

Istanbul

July-2024

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Supervisor

Dr. Öğr. Üyesi Mohamed Cherif El AMRI

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APPROVAL PAGE

This study has been approved in partial fulfillment of the requirements for MA Degree
in Islamic Economics and Finance

Supervisor Dr. Mohamed Cherif El AMRI ()

Member of Jury Dr. Abdelkader CHACHI ()

Member of Jury Dr. Omar KACHKAR ()

Approval by

Prof. Dr. Erhan İÇENER

Director, Graduate Education Institute

DECLARATION OF SCIENTIFIC ETHICS AND ORIGINALITY

This is to certify that this MA thesis titled “Integrating Artificial Intelligence in Moroccan Islamic Banks: Challenges and Prospects” is my own work and I have acted according to scientific ethics and academic rules while producing it. I have collected and used all information and data according to scientific ethics and guidelines on thesis writing of Istanbul Sabahattin Zaim University. I have fully referenced, in both the text and bibliography, all direct and indirect quotations and all sources I have used in this work.



Ayman AMMARA

Istanbul, July 2024

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ABSTRACT

INTEGRATING ARTIFICIAL INTELLIGENCE IN MOROCCAN ISLAMIC BANKS: CHALLENGES AND PROSPECTS

Ayman AMMARA

M. A., Department of Islamic Economics and Finance

Supervisor: Dr. Öğr. Üyesi Mohamed Cherif EL AMRI

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The intersection of Islamic finance and the digital revolution has created opportunities for novel research directions. This study seeks to assess the current extent of Artificial Intelligence (AI) implementation within the Islamic banking sector in Morocco, exploring its potential prospects and the associated challenges. Employing a qualitative approach, this research integrates a comprehensive literature review alongside ten semi-structured interviews conducted among relevant professionals from Islamic banks, Islamic financial institutions, and AI sectors in Morocco. The findings indicate that the Islamic banks in Morocco have not yet embraced the use of AI, although there is some limited utilization of Fintech for online banking and fraud detection. This can be attributed to the lack of readiness in the regulatory framework and technological infrastructure of the country to accommodate such innovations. Additionally, the investment in IT is relatively low and the expertise of banking professionals requires enhancement. Nevertheless, if AI were to be implemented in these institutions, significant benefits could be anticipated. These include effective cost management and streamline expenses, advanced decision-making support, and most importantly, an increase in the market share of Islamic banks in the country. This would lead to intensified competition with conventional banks, primarily through the adoption of practical banking solutions and improved customer services. Furthermore, it would contribute to enhancing the brand image of the Islamic banking sector. This thesis proposes recommendations for facilitating AI integration, such as the development of specific regulatory policies and investment in staff training.

Key terms: Artificial Intelligence, Islamic Banks, Morocco, Challenges, Prospects.

ÖZET

FAS İSLAM BANKASI'NDA YAPAY ZEKÂNIN ENTEGRASYONU: ZORLUKLAR VE BEKLENTİLER

Ayman AMMARA

Yüksek Lisans, İslam Ekonomisi ve Finans

Tez Danışmanı: Dr. Öğr. Üyesi Mohamed Cherif EL AMRI

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İslami finans ve dijital devrimin kesişimi, yeni araştırma yönleri için fırsatlar yaratmıştır. Bu çalışma, Fas'taki İslami bankacılık sektöründe Yapay Zeka (AI) uygulamasının mevcut kapsamını değerlendirmeyi, potansiyel beklentilerini ve ilgili zorlukları araştırmayı amaçlamaktadır. Nitel bir yaklaşım kullanan bu araştırma, kapsamlı bir literatür taramasının yanı sıra Fas'taki İslami bankalar, İslami finans kurumları ve yapay zeka sektörlerinden ilgili profesyoneller arasında yapılan yarı yapılandırılmış görüşmeleri entegre edecektir. Bulgular, Fas'taki İslami bankaların henüz yapay zeka kullanımını benimsemediğini, ancak çevrimiçi bankacılık ve dolandırıcılık tespiti için Fintech'in bazı sınırlı kullanımları olduğunu göstermektedir. Bu durum, ülkenin düzenleyici çerçevesinin ve teknolojik altyapısının bu tür yeniliklere hazır olmamasına bağlanabilir. Ayrıca, BT'ye yapılan yatırım nispeten düşüktür ve bankacılık profesyonellerinin uzmanlığının geliştirilmesi gerekmektedir. Bununla birlikte, yapay zekanın bu kurumlarda uygulanması durumunda, önemli faydalar beklenebilir. Bunlar arasında etkin maliyet yönetimi ve giderlerin düzene sokulması, gelişmiş karar alma desteği ve en önemlisi, ülkedeki İslami bankaların pazar payında bir artış yer almaktadır. Bu durum, öncelikle pratik bankacılık çözümlerinin benimsenmesi ve müşteri hizmetlerinin iyileştirilmesi yoluyla konvansiyonel bankalarla rekabetin yoğunlaşmasına yol açacaktır. Ayrıca, İslami bankacılık sektörünün marka imajının geliştirilmesine de katkıda bulunacaktır. Bu tez, belirli düzenleyici politikaların geliştirilmesi ve personel eğitimine yatırım yapılması gibi yapay zeka entegrasyonunu kolaylaştırmaya yönelik öneriler sunmaktadır.

Anahtar Sözcükler: Yapay Zeka, İslami Bankalar, Fas, Zorluklar, Beklentiler.

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LIST OF ABBREVIATIONS

| | | |
|-------------|-------|--|
| AI | ----- | Artificial Intelligence |
| AML | ----- | Anti-Money Laundering |
| ATM | ----- | Automated Teller Machine |
| BAM | ----- | Bank Al Maghrib |
| BBVA | ----- | Banco Bilbao Viscaya Argentaria |
| BCP | ----- | Banque Centrale Populaire |
| BISB | ----- | Bahrain Islamic Bank |
| BMCE | ----- | Banque Marocaine du Commerce Extérieur |
| BMCI | ----- | Banque Marocaine pour le Commerce et l'Industrie |
| BTI | ----- | Bank Attamwil wal Inmae |
| CAGR | ----- | Compound Annual Growth Rate |
| CB | ----- | Conventional Bank |
| CDM | ----- | Crédit du Maroc |
| CEO | ----- | Chief Executive Officer |
| CIH | ----- | Crédit Immobilier et Hôtellerie |
| CLR | ----- | Comprehensive Literature Review |
| CNDP | ----- | Commission Nationale de Contrôle de Protection de Données à Caractère Personnel |
| CRM | ----- | Customer Relationship Management |

| | | |
|-------------|-------|--|
| DH | ----- | Dirham |
| DIB | ----- | Dubai Islamic Bank |
| DL | ----- | Deep learning |
| GCC | ----- | Gulf Cooperation Council |
| GDP | ----- | Gross Domestic Product |
| HCP | ----- | Haut-Commissariat au Plan |
| IB | ----- | Islamic Bank |
| IBM | ----- | International Business Machines Corporation |
| ICD | ----- | Islamic Corporation for the Development of the Private Sector |
| IFI | ----- | Islamic Financial Institution |
| IFSB | ----- | Islamic Financial Services Board |
| IFSI | ----- | Islamic Financial Services Industry |
| IsDB | ----- | Islamic Development Bank |
| IT | ----- | Information technology |
| KFH | ----- | Kuwait Finance House |
| KYC | ----- | Know Your Customer |
| MAD | ----- | Dirham Marocain |
| MENA | ----- | Middle East and North Africa |
| MIB | ----- | Moroccan Islamic bank |
| ML | ----- | Machine Learning |

| | | |
|-------------|-------|--|
| QIIB | ----- | Qatar Islamic International Bank |
| RPA | ----- | Robotic Process Automation |
| SA | ----- | Société Anonyme |
| SME | ----- | Small and Medium Enterprise |
| SWOT | ----- | Strengths Weaknesses Opportunities Threats |
| UAE | ----- | United Arab Emirates |
| US | ----- | United State |
| USD | ----- | United State Dollar |

CHAPTER I

INTRODUCTION

This chapter is dedicated to the introduction of the thesis, which will be presented through seven sections following this introductory paragraph. The first section will provide a description of the study's background. The second section will address the problem statement of the study, while the third section will outline the objectives of the study. The fourth section will note down the questions to be answered through this thesis, and the fifth section will elucidate the significance of the chosen subject. Afterwards, the sixth section will address the scope and limitations of the study, to finalize the chapter with the seventh and last section where the outline of the study is listed.

1.1 Background of the study

The past few years has witnessed a growing emphasis on Islamic finance and economics, primarily due to the expansion of Islamic banks on a global scale. The growing presence of these institutions has contributed to the recognition and adoption of Islamic financial practices worldwide. Domat (2019) defines Islamic Banking as a *Shariah* based system of banks that works under the frame of Islamic laws, where the *Riba*, *Gharar*, and *Mayssir* (Respectively; usury, uncertainty, and gambling) are strictly forbidden, additionally to some specific manufacturing activities such as arms, and Alcohol (ARSLAN et al., 2020: 481). The emergence of instituting this specific system of banking was driven essentially by the religious standpoint, particularly because Muslim communities seek to faithfully implement the *Shariah* laws in all their activities.

The Islamic banks (IBs) offer 100% Halal products and services like *Murabahah*, *Mudarabah*, *Musharakah*, *Ijarah*, etc... They are based on the profit and loss principle which differs totally from the conventional system of banks. In fact, the Islamic banking contracts if digitalized to smart contracts, they can ensure the credibility of transactions avoiding its authenticity to be put at risk (Mat Rahim et al., 2018). However, Kausar ABBAS & Muhammad HAFEEZ (2021: 316) announce that these

proposed contracts might face the challenge of deciding and confirming their *Shariah* compliancy.

The other reason that increases the attention of researchers and investors towards the Islamic way of banking, is that the financial crises exposed the failures and incapability of banks to undergo the critical situations notably the subprime crisis in 2007-2008, where, according to several studies, Islamic banks were steadier and more resistant than conventional banks in the period of crisis as mentioned in the research of (Bourkhis & Nabi, 2013: 75).

Over the last ten years, there has been a notable evolution in the field of financial technology (fintech), shifting from simple online banking interfaces to sophisticated platforms that provide a wide range of services previously exclusive to traditional banks. Key technologies like blockchain, artificial intelligence, and big data analytics have been instrumental in driving this change. Financial institutions have acknowledged the benefits of these technologies in improving efficiency, customer satisfaction, and cost reduction, prompting them to allocate more resources towards fintech solutions. (Ernst & Young, 2019)

The propagation of artificial intelligence entails the adaptability and readiness of societies for the purpose of a correct exploitation in different sectors. In Islamic finance and economics, the use of artificial intelligence is newly introduced, and it is already gaining big attention in these years along with the increasing importance of this field among the others. Moreover, it has the potential to score large benefits and assist the improvement of the economic and financial situation of the countries. Nevertheless, *Shariah* compliancy, rules and ethics must be taken in consideration while applying the artificial intelligence in any department of Islamic finance and economics. The importance of Islamic banks should be considered carefully in terms of keeping up with digitalisation and realizing big numbers and achievements in the banking sector.

The year 2017 marked a significant turning point for Morocco's banking industry, with a particular emphasis on the Islamic banking sector. In this year, the Central Bank of Morocco issued a press release that marked the establishment of the first five Islamic banks and three participative windows. These financial institutions, namely Umnia Bank, Bank Assafa, Bank Attamwil wal Inmae (BTI Bank), Bank al Yousr, Alakhdar

Bank, Bank Najmah, Bank Arreda, and Dar Al Aman, were granted approval to engage in participative banking activities. This development showcased the growing prominence and recognition of Islamic banking in Morocco's financial landscape.

According to the IFSI, in 2022, the Moroccan Islamic banking portion in total banking assets by jurisdiction was by 2%. (Islamic Financial Services Industry Stability Report, 2023).

In its review “Banques participatives: Rentabilité pour 2023”, the financial newspaper “La vie Éco” concurred that the Islamic banking sector reached 21.5 billion DHs (Approximatively 2.2 billion US dollar) in June 2022 with an annual growth of 96% between 2018 and 2022. (Hafidi Mohamed A., 2022).

The role of technology is quite outstanding in every field and department, including Islamic finance and economics and especially in the Islamic banks. Among all the tech tools, artificial intelligence is widely used to facilitate the task of numerous activities. The Islamic financial institutions would find good interest in opening gates for innovative opportunities and lead the way for more advantageous solutions.

With the advent of artificial intelligence, the banking industry is poised for a transformative shift, as it automates various processes, improves communication, and enhances the overall quality of banking services.

The incorporation of AI technologies into the banking industry in Morocco is expected to yield numerous financial advantages, as they are poised to significantly improve the quality, range, and profitability of the services and products offered. Nonetheless, the absence of a well-established legal framework for AI technology and its algorithms could hinder the widespread adoption of this technology. (Ouidani & Oulcaïd, 2023)

Bachir & Marzouki (2023: 368) argue that Morocco must double its efforts in strengthening the security measures and defence mechanisms of its information systems. In addition, the country still needs to promote the development of skilled professionals in this field who possess the ability to analyse and comprehend technological techniques, as well as efficiently manage computer security services and systems. In order to accomplish this, it is crucial to prioritize aligning the education sector with the industry's requirements.

While many Islamic banks in the MENA countries have already integrated artificial intelligence into their operations, the same cannot be said for Morocco. The

implementation of this advanced technology has not yet been observed in the Islamic banking system of this country. This study seeks to assess the current extent of Artificial Intelligence (AI) implementation within the Islamic banking sector in Morocco, exploring its potential adoption added to the associated challenges.

1.2 Problem Statement

The intersection of Islamic finance and the digital revolution has created opportunities for novel research directions. In Morocco, the discussion surrounding the implementation of artificial intelligence in the banking sector is still in its early stages. Consequently, there is a lack of scholarly articles addressing the potential opportunities and obstacles associated with the application of artificial intelligence in Moroccan Islamic banks. This research aims to bridge this gap and provide valuable insights through the completion of this thesis.

1.3 Objectives of the study

Through this study, three objectives are set to be achieved:

1. To examine the state of the art of the technology adoption in Moroccan Islamic Banking.
2. To investigate the challenges faced by Moroccan Islamic banking in adopting AI.
3. To examine the prospects and future strategies for enhancing AI adoption in Moroccan Islamic Banking.

1.4 Research Questions

This study seeks to answer the following queries in order to attain the stated objectives:

1. What is the current status of technology adoption in Moroccan Islamic banks (MIBs)? And what advancements have been made in this field?
2. What are the obstacles encountered by MIBs in embracing artificial intelligence?
3. What are the expected prospects from the implementation of artificial intelligence in Moroccan Islamic banks and what are the recommended future approaches that could be adopted to optimize this endeavour?

1.5 Significance of the Study

The originality of the chosen subject matter for this thesis primarily lies in the fact that MIBs have not yet embraced the use of AI in their activities, and additionally, there is a lack of prior research focusing on the potential challenges or opportunities associated with the implementation of AI in Islamic banks in Morocco, likewise, the dearth of literature regarding the use of AI in Islamic banks. Also, this thesis may contribute to the flourishing of the Moroccan dual banking market in general, and the MIBs in particular.

This study seeks to draw the attention of consulting officers, researchers, and academicians, urging them to devote more efforts towards conducting and realizing studies in the realm of Islamic banking and technological innovation. This is especially important in countries where Islamic banking has not been implemented, as it requires the identification of innovative solutions for Islamic banks. Furthermore, policymakers should consider incorporating these innovative solutions within the regulatory frameworks of Islamic financial institutions. Additionally, employees and clients of Islamic banking should raise their awareness and enhance their skills in areas such as artificial intelligence and other technological solutions to effectively prepare for forthcoming advancements. Lastly, this thesis is also intended for students who have a keen interest in these disciplines providing them with the necessary direction for their academic and professional career.

1.6 Scope and Limitations

Out of the expanded area of Islamic banking and finance and the various innovations that marked the digitalization era worldwide, the subject of this thesis focuses on the Islamic banking sector in the country of Morocco and the artificial intelligence technology.

The banking sector was specifically chosen due to its emergence, substantial size, and critical significance in the Moroccan state. This is particularly noteworthy as AI applications in the financial sector have far-reaching implications and present tremendous benefits and opportunities.

Various challenges were encountered during the writing of this thesis throughout its different stages. The literature review proved insufficient in terms of addressing the combination of artificial intelligence and the Islamic banking system, and there was a

noticeable dearth of studies investigating the intersection between these two domains in Morocco. Furthermore, the limited number of professionals well-versed in both artificial intelligence and Islamic finance in Morocco posed a significant challenge, and the unavailability of the intended interviewees further hindered the smooth progression of the thesis.

1.7 Thesis Outline

This thesis is divided into five chapters. The first one is an introductory chapter, as it encompasses the background of the study, the problem statement, the research questions and objectives, the scope and limits of the study, and the thesis outline.

Moving on to the second chapter, it will delve into the literature review. This section will explore previous studies that are relevant to the subject matter of the thesis. The literature review will be divided into three parts. The first part will focus on the literature review pertaining to Moroccan Islamic banks, including their history and current statistics. The second part will examine the relationship between artificial intelligence and the banking system. Lastly, the third part will discuss the integration of artificial intelligence in Moroccan Islamic banks in a general sense. It will initially highlight the utilization of AI in various Islamic banks across MENA countries such as Kuwait and the U.A.E. Subsequently, it will address the challenges and prospects identified by researchers in this field before narrowing down the focus to the Moroccan market.

Afterwards, the third chapter will provide detailed information about the methodology employed in the thesis. It starts by a general overview on the research design, defining the methods and methodologies around the comprehensive literature review and semi-structured interviews. The focus on these research methods is clarified in this chapter along with the targeted interviewees and Morocco as an area of study.

The fourth section of this thesis is dedicated to analysing the different findings obtained from interviews and the literature review. Within this chapter, the current state of AI adoption in Moroccan Islamic banks is thoroughly discussed based on the gathered answers and information from the interviews and literature review. Also, the challenges hindering this integration are also debated from the same sources alongside the strategies to overcome these obstacles, and the prospects awaited from this endeavour.

Finally, the fifth and last chapter will conclude the thesis by summarizing the previously discussed ideas, emphasizing their contribution to knowledge, and providing recommendations and suggestions for future research.



CHAPTER II

LITERATURE REVIEW

Within this section, four primary concepts are explored. After shedding some lights on the Fintech use in the banking sector, the first idea examines the surge in AI implementation within banks, offering definitions and a historical overview of the technology before presenting the authors' viewpoints. The second concept provides a global perspective on AI adoption in Islamic banks, commencing with a historical account and statistical data on Islamic finance and banks worldwide, followed by illustrations of AI-driven initiatives in these banks. The third part delves into AI adoption in Moroccan Islamic banking, narrating the narrative of participative banks in Morocco, their development, and the utilization of AI and Fintech in the national banking landscape. The fourth part addresses the obstacles encountered in integrating AI into Moroccan participative banks, outlining potential challenges for the global banking sector associated with AI utilization. Lastly, the chapter concludes with a summary and discussion.

2.1 Evolution of technology adoption in Banking:

The incorporation of technology within the banking industry has experienced significant evolution starting from the introduction of the first automated teller machines (ATMs) in the 1960s to the advanced digital banking platforms in use today. In the early stages, the use of technology was predominantly focused on enhancing the effectiveness of operations and minimizing errors in back-office tasks. Throughout the years, technological advancements have continuously revolutionized all aspects of banking, ranging from customer service and transaction processing to security and risk management. (Bátiz-Lazo, 2018)

Major technological breakthroughs within the banking industry include the widespread integration of internet banking in the 1990s, providing consumers with the ability to manage their finances through online channels. The advent of mobile banking in the early 2000s empowered customers to engage in financial transactions directly from their mobile devices. More recently, the incorporation of blockchain

technology and the introduction of cryptocurrencies have commenced reshaping payment systems and settlements in the financial sector. (Brett King, 2018).

The term FinTech can be traced back to the early 90s when it was first used to refer to the (Financial Services Technology Consortium), a project launched by Citigroup to promote collaboration in technological advancements within the financial services industry. The 2008 global financial crisis marked a significant shift, contributing to the rise of FinTech as a prevailing trend. Throughout history, banks have traditionally been at the forefront of financial innovations. In the present day, innovation is predominantly driven by small FinTech companies rather than traditional banks. Despite their distinct approaches, both FinTechs and banks stand to benefit greatly from collaborating. (Sofia Anyfantaki, 2016)

According to Ezzahid & Elouaourti (2021), Fintech, derived from the term "Financial technology," refers to the collection of technological advancements that have been implemented within the financial sector in recent years. It provides mobile banking solutions to rural communities in order to address challenges arising from geographical isolation and to lower the expenses associated with remittance transactions. Additionally, rich individuals benefit from enhanced advisory services powered by artificial intelligence, enabling tailored assistance to be delivered promptly.

Arner et al. (2015) displayed three principal phases of the Fintech growth. Fintech 1.0 as the first era was marked by the rapid transmission of financial information, transactions, and payments worldwide was made possible by advancements in technology such as the telegraph, railroads, canals, and steamships between 1866 and 1967. Concurrently, the financial sector played a crucial role in funding the development of these technologies. After 1967 with the ATM appearance, the advent of digital technology for communication and transaction processing gradually transformed finance into a digital industry. By no later than 1987, the digitization of the financial services, using technology to offer products and services, marked the Fintech 2.0 era which persisted until the subprime crisis 2008. Finally, the ongoing phase none as Fintech 3.0 is characterized by the rise of start-ups and Tech organizations that provide innovative financial products and services linking the technology to the financial activities.

The global Fintech market value in 2023, as analyzed in the Fortune Business Insight report, was primarily controlled by banks, accounting for a dominant share of 39%. This market dominance can be attributed to the banks' ability to swiftly and seamlessly onboard new customers. By streamlining the account setup process, banks have effectively reduced the time and effort required, giving them a competitive advantage over financial institutions, insurance companies, and other players in the market. Moreover, the integration of market players with technologically advanced banks has facilitated the provision of modern digital payment solutions, including mobile wallets and contactless payments. This collaborative approach has significantly contributed to the growth of this segment. The same report estimates that the valuation of the global fintech market stood at USD 294.74 billion in 2023. Looking ahead, this market is expected to experience substantial expansion, with an estimated worth of \$340.10 billion in 2024. Moreover, it is projected to achieve a remarkable value of \$1,152.06 billion by 2032, demonstrating a compound annual growth rate (CAGR) of 16.5% during the forecast period from 2024 to 2032. (*FinTech Market Overview with Size, Share, Value | Growth [2032], 2024*)

According to McKinsey & Company through the report of Lindsay Anan et al. (2023), the banking sector witnessed a remarkable achievement in 2022, by generating over \$6.5 trillion in revenues. This figure reflects a substantial growth in both volume and revenue margins compared to the previous year. Notably, Fintech platforms played a significant role in this success, contributing approximately 5 percent, which amounts to a substantial range of \$150 billion to \$205 billion, to the net revenue of the global banking industry. Digital channels account for around 73% of the world's interactions with banks.

In 1950, the Artificial Intelligence concept was first introduced as an academic branch of knowledge. 50 years later, the discipline commenced to be considered as major field of research. It is categorized into analytical AI, human-inspired AI, and humanized AI, according to which kind of intelligence (cognitive, emotional, or social intelligence) it is relied to. (Cannataro et al., 2022).

Based on the Encyclopedia of Bioinformatics and Computational Biology (2019), the Artificial intelligence (AI) refers to “the property of machines that mimic human intelligence as characterized by behaviours such as cognitive ability, memory, learning, and decision making.” (Scarcello, 2019).

According to the explanation given by the IBM website, there is a link between artificial intelligence, machine learning and deep learning, in a way that the artificial intelligence is the intelligent machine concept creator and the broad system, Machine learning is a fragment of AI, and deep learning is a subdomain of machine learning like it is shown in the next figure.

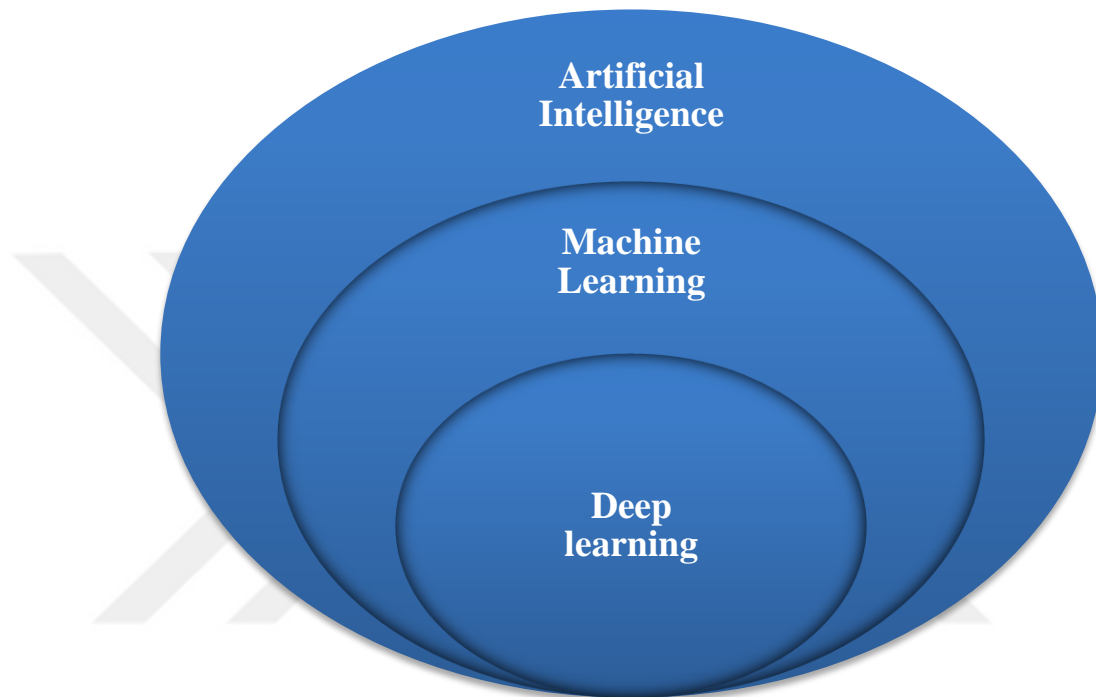


Figure 2.1: AI vs ML vs DL

Source: (*AI vs. Machine Learning vs. Deep Learning vs. Neural Networks: What's the Difference?*), (2023)

McCarthy J. (2004) the “father” of Artificial Intelligence who brought in the term in 1956, defines it as a smart machine-based software that is able to understand the human language and resolve a problem or achieve a goal like human do. Khan, S. & Rabbani, M.R (2020) define the AI as a computer science’ innovation of a creating an intelligent device, as considered by human, that can plan and respond in accordance with each specific situation. (Rabbani et al., 2022)

It provides a fast increase of technology as Kausar ABBAS & Muhammad HAFEEZ (2021) cited from Abdullah (2017)’ study, that the world is entering the era of Artificial Intelligence and digital banking 4.0 as he ranked this latter into 4 generations displayed in the following pyramidal list:

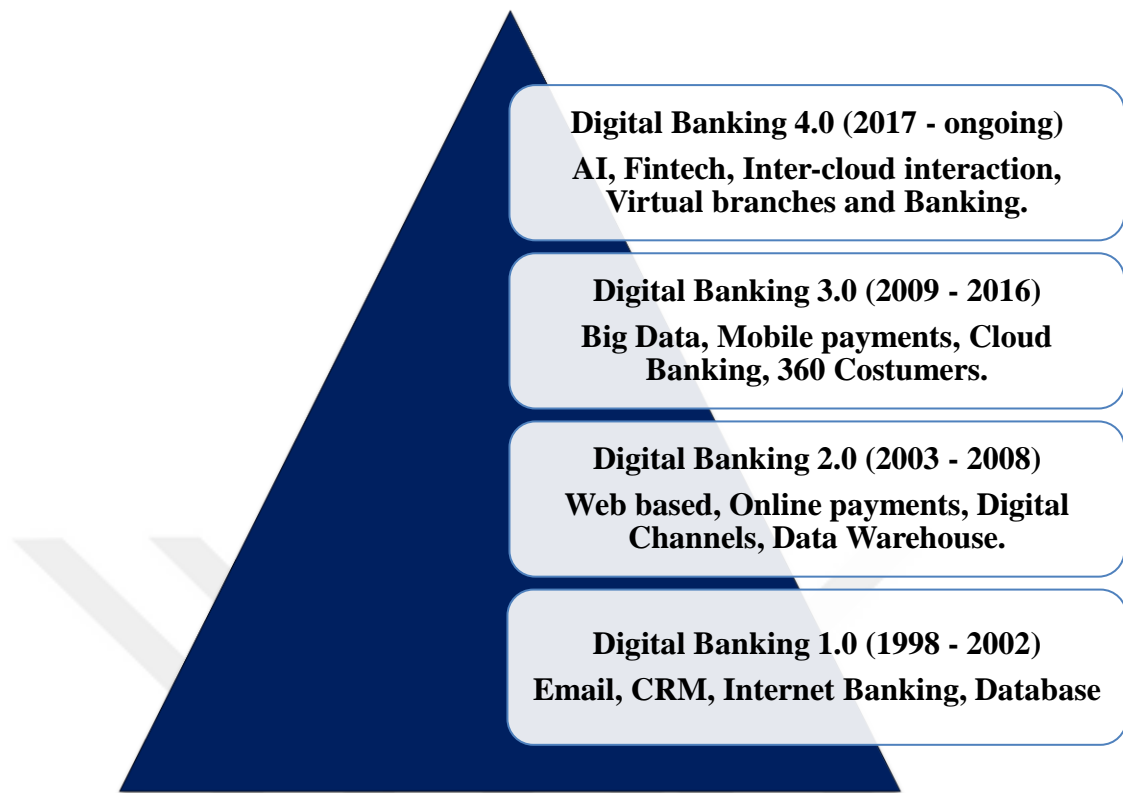


Figure 2.2: Growth of Digital Banking Abdullah (2017) and Kmeid (2017).

Source: Kausar ABBAS & Muhammad HAFEEZ, 2021

The history of AI goes back to the very half of the 20th century, when Alan Turing (1912-1954) a British polymath suggested that a machine could mimic a human being by processing in the same way as he processes when solving problems and taking decisions. He determined through his test that the intelligence level of machines is quite the same. As it is shown in the next historical figure, the first glances of AI were appearing centuries before the first adoption of the term by Jon McCarthy in 1957. (Mijwil, 2015)

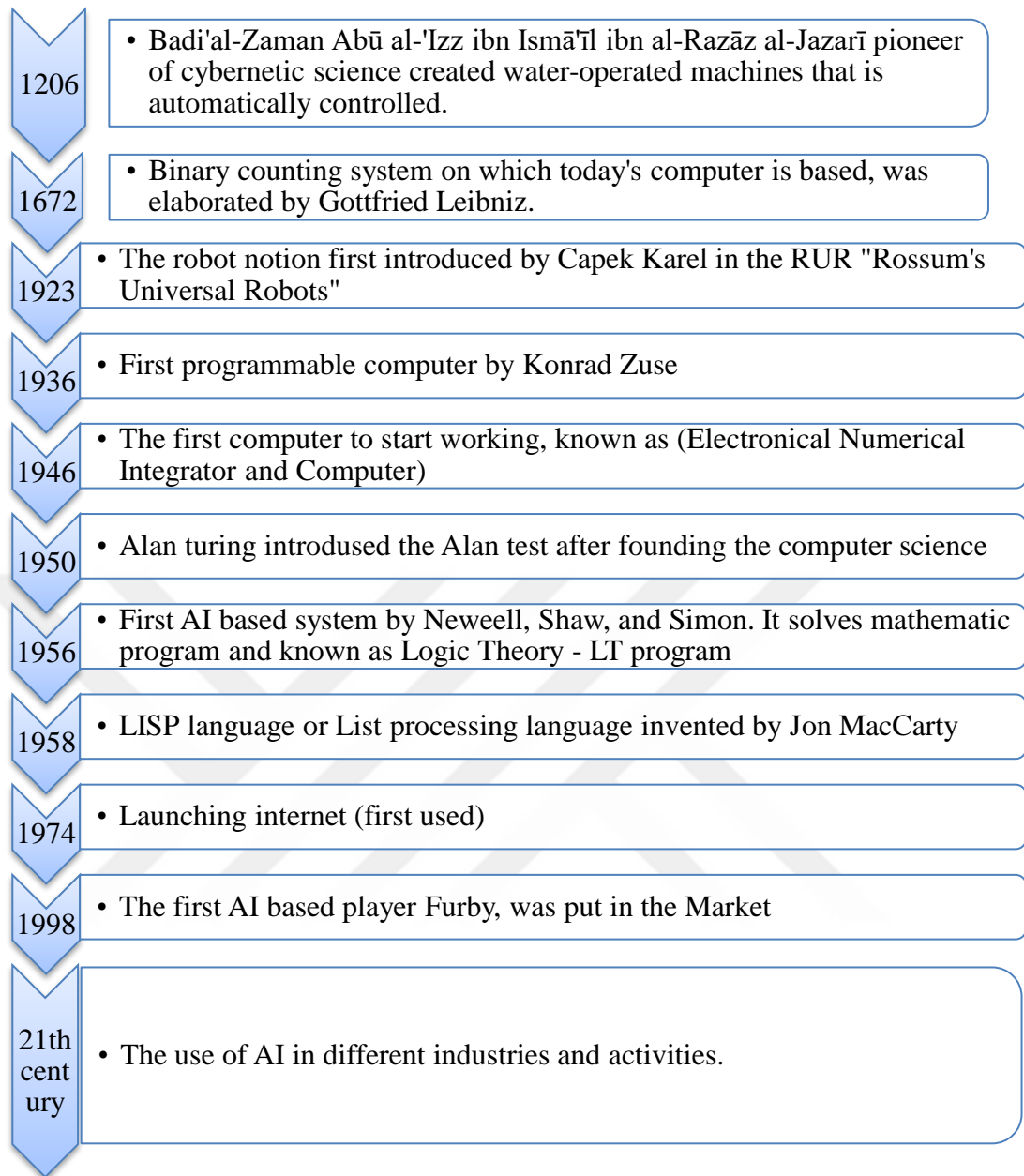


Figure 2.3: A brief history of AI.

Source: (Mijwil, 2015)

The Artificial Intelligence nowadays is involved in almost every domain of activity, but the TATA Consultancy survey on 835 investment enterprises around the globe that are using AI showed that the IT department is dominant in this matter with a 34% to 44% rate in 4 different sectors of work as we will project in the coming table. The marketing AI use scored between 15% and 19% among the global companies surveyed, and the Finance and Accounting department plus Customer service reached respectively 17% and 15% of surveyed companies that use AI. (Gazali et al., 2020)

Table 2.1: The departments studied in TATA Consultancy’s survey.

| Information Technology | Marketing | Finance and Accounting | Customer service |
|---|--|---|--------------------------------|
| Detecting and deterring security intrusions. | Predicting upcoming customer acquisitions and tailoring promotions accordingly. | Financial trading (e.g., high-frequency trading enabled AI) | Automating call distributions. |
| Resolving users’ technology problems. | Improving media buying. | | |
| Reducing protection Management work by automation. | Analysing social media feedback to assess general brand sentiment and identify potential concerns. | | |
| Evaluating internal conformity with the use of sanctioned technology vendors. | Tailoring promotions (online and offline) | | |

Source: (Gazali et al., 2020)

One of the most basic features of intelligent machines is the ability to learn. It helps develop human skills such as driving cars, playing chess, and chat with humans etc.... Among many other AI based achievements, the medical sector is one of the biggest industries to rely on this technology, with numerous successful uses of the neural networks that were based on the brain’s neurons’ behaviour. (Scarcello, 2019)

The health care industry is benefiting hugely from the Artificial Intelligence technology, forasmuch it is applied in several medical operations and activities like the analysis of medical information, the recognition and diagnosis of illnesses, pharmaceutical industry including drugs inventions, vaccine upgrades, tracing the virus and estimating its nature, also the Robot based surgery, and keeping the patients’

condition under surveillance. However, it is recommended that the evolution of AI should be adopted in parallel with the ethics in terms of its actions and decisions, and it will never replace the doctors because of three main motives; Responsibility, accuracy, and credibility. (Tiwari et al., 2022)

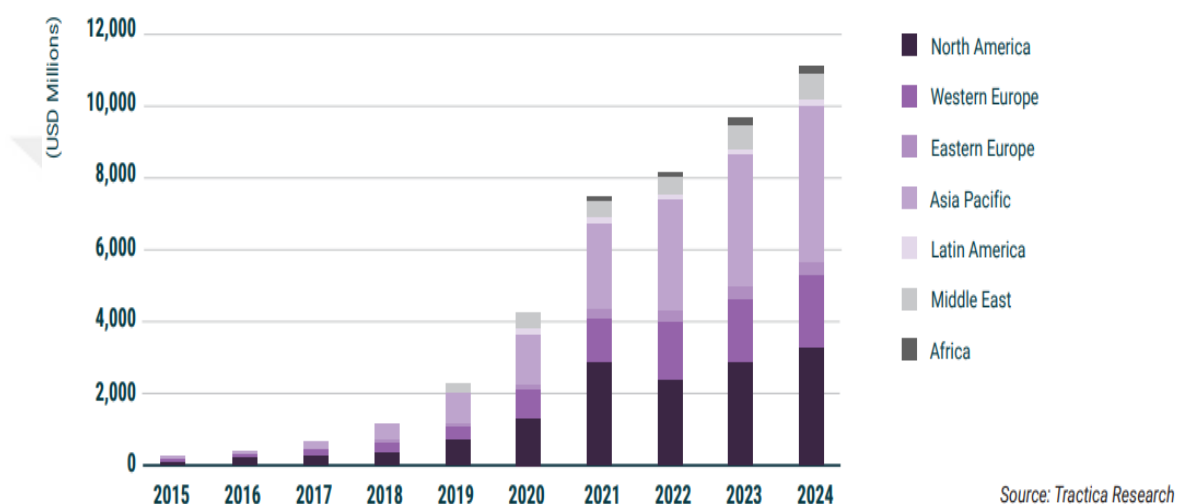
According to Bahrammirzaee (2010), Jadhav et al. (2016), several studies review the approach of Artificial Intelligence in the banking system without focusing on all commercial banks areas of work. The implementation of AI is already revolutionizing the banking industry, as it holds the ability to optimize the processing of a big amount of Data in a shorter time comparatively to the human ability. Artificial Intelligence could be used in the banking risk management, as a detector tool of fraudulent activities, money laundering, and other functions in electronic banking, financial statements, and credit cards related services, as it is stated by Jadhav et al. (2016). The same authors mention the US treasury department system that assists banks in identifying fraudulent cash transactions. They also find that the utilization of AI concerns limited number of banking services including stock forecasting and credit evaluation by major investment banks, as well as credit scoring by credit card companies. (Königstorfer & Thalmann, 2020)

The concept of Artificial Intelligence (AI) involves the replication of human intelligence to create intelligent machines that optimizes the accuracy of decision taking and the efficiency of tasks performance. From the sustainable development view, the introduction of modern banks that rely on AI will not only improve banking services, but also preserve the nature by diminishing resource depletion and environmental pollution as the authors quoted from the research R. F. Malaquias et A. F. Silva, (2020). The integration of AI plays a pivotal role in expanding the banking industry by facilitating low-value transactions and attracting more customers. Besides, it mitigates loan losses, minimizes potential risk, detects fraudulent activities, enhances the security of payment-processing systems, automates compliance tasks, and refines client targeting. It is also certain that implementing the artificial intelligence to realise business and sustainability goals, optimize resources efficiency and economical gains. (Azouaoui et al., 2023)

Alfaro et al. (2019) quoted that the artificial intelligence assisted the “Banco Bilbao Viscaya Argentario (BBVA)” in its profit and revenue improvement, by optimizing the customer targeting and business operations, alongside the spotting of more suitable

locations for the branch network, plus other benefits that generated a cost reduce. The profitability of loans requires a creditworthiness assessment of the bank’s customer. Also, the banks need to make sure that the payments’ processes are operational, safe, and maintained at a proper interval.

The IsDB report titled “Future of Finance Redefining the Role of Finance in an Industry 4.0 World” shared in 2022, displays a graph sourced by “Tractica Research” that shows the expected revenue of AI on world economies in 2022, 2023, 2024, and also the revenue realized in previous years as it is shown in the following picture:

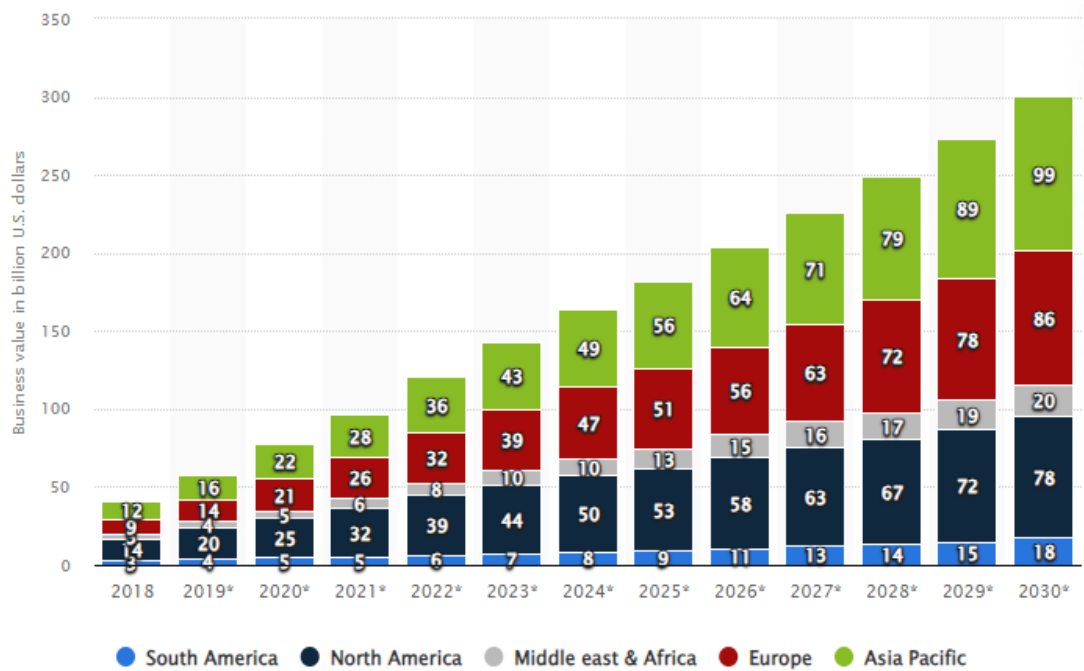


Picture 2.1: AI Expected Revenue

Source: Future of Finance; Redefining the Role of Finance in an Industry 4.0 World., 2022

In the report, it is estimated that the year 2030 may witness a 13 trillion US dollar in terms of global GDP, as the artificial intelligence and other technologies would open the gates for new important investment and business opportunities. It also mentions that the revenue of the financial industry is involved in digitalization by 85%. Future of Finance; Redefining the Role of Finance in an Industry 4.0 World., 2022

Another report from the (Statistica) website, forecasts the potential growth of AI revenue in the banking industry for the next 7 years additionally to its actual impact during the last 6 years including the ongoing 2023. The data is illustrated in the next picture:



Picture 2.2: AI based business value in the banking industry worldwide.

Source: Statista 2023. Bergur Thormundsson, 2022

The forecasted figures demonstrate the potential business value that can be obtained by leveraging artificial intelligence within the banking industry from 2018 to 2030. The estimations suggest that by 2030, the utilization of AI in the banking sector will result in an approximate value of 20 billion U.S. dollars in the MENA region which include the banking sector in Morocco, compared to a huge 99 billion U.S. dollars forecasted in the Asia Pacific region.

Orçun Kaya et al. (2019), say that to maintain the competitiveness in the market, banks are leaning more towards AI adoption that would substitute the high-cost, ordinary and exhausting activities. AI henceforth is an ameliorated paradigm shifter in innovating and developing regular businesses.

It is worth to mention, according to Harasim (2016), that the online payments so called non-cash payments is becoming more and more common within the banks' customers, which makes their shopping behaviours tracked through the detailed data that is received by the tracker which is the banks or payment service providers.

Alsheibani et al. (2018) points out that the improved efficiency of regular activities by using AI would lead to a better customer experience. In the same matter, Vijai (2019) compares the traditional human advisory services to the auto-servicing AI robots,

chatbots, and other basic AI utilization in banks, saying that this latter is more beneficial than the first part.

The bank of Tokyo applied similar AI applications in some of their branches, using the humanoid robot “Nao” to guide the customers and carry out duties within the 24h banking concept, unlike the human ability that is limited in terms of working time, plus the ability of the AI-based invention to process multilingual options. The robot gets to read the customer emotions according to the tone of their voices and facial expressions. (Marinova et al., 2017). Rahman et al. (2021) quoted from Royle et al., (2015)’s study that with such practices, the Bank of Tokyo succeeded in saving time for their branch’s employees who become able to achieve more innovative and valuable services.

Rahman et al. (2021) mentioned the example of the Bank of America that is currently adopting one of the basic AI tools known as the Chatbots and it is actually improving the customer involvement, by providing a 24h/7d availability for any banking service alongside the capability to handle a vast amount of inquiries at the same moment, which optimizes the bank’s functional efficiency. Besides, the financial Chatbots are able to assist the bank’s customers overcome the daily cash management difficulties, leading to better consuming decisions and smarter monetary plans which strengthen their overall financial condition. When customers are using the Chatbots, the banks are gathering the conversation as a data to be analysed in order to have an idea about his tendencies and consuming manners. The AI scrutinizes the recorded data, and projects rational and operable patterns that allow the banks to recognize former unidentified marketing shots, by for example choosing the very right moment to interact with a customer. Also, the risk management issue is involved in this matter, as the AI optimizes the duo time and money when detecting frauds after identifying outliers in the data collected.

Investing in AI technology became a must for the banks as they are working hard to learn how to detect the way customers behave starting from their experiences. The bank would therefore adjust its offers and services to the customer, depending on his needs, as explained by Ronald Schmelzer (2019), by using the AI and getting over the challenges faced by the normal customer services like the guidance for loan decisions and regulatory conformity.

Dr. Navleen Kaur et al. (2020) enumerated 11 reasons of having AI in the banks' system:

- Rises big challenges in the banking sector.
- Pushes towards a process-driven maneuver.
- Starts self-service in the subdivisions.
- Triggers the desire of customers to engineer customized solutions.
- Establishes practical efficiencies.
- Improve the staff's productivity.
- Optimize the productivity and efficiency.
- Adopting robots as an extension to human banking services.
- Mitigates fraud and scam risk.
- Insure the management of large data set in a record time.
- Help taking efficient decisions.

In fact, this summarizes the prospects of using AI in banks whether in Morocco or anywhere in the world, and in both Islamic and Conventional types of banking. Hence, the next part will introduce the use of artificial intelligence in the Islamic banks.

2.2 AI adoption in Islamic Banking: Global overview:

The idea of Islamic banking emerged mostly if not totally during the second part of the 20th century. Mit Ghamr was the first interest-free bank established in Egypt in 1963 followed by several Islamic banks in different country as projected in the following figure:



Figure 2.4: The history of Islamic banks’ creation.

Source: Kaplan, 2020

Overall, the Islamic financial sector is smoothly developing year by year. As it is reported in the “ICD – Refinitiv Islamic Finance Development Report 2022” this industry scored a 17% growth in 2021 outperforming the Covid-19 outbreak, reaching a 4 trillion USD worth of assets through 1679 Islamic financial institution (ICD – Refinitiv Islamic Finance Development Report 2022 Embracing Change, 2022).

The same source projected important numbers in the development of Islamic finance as displayed in the following figures:

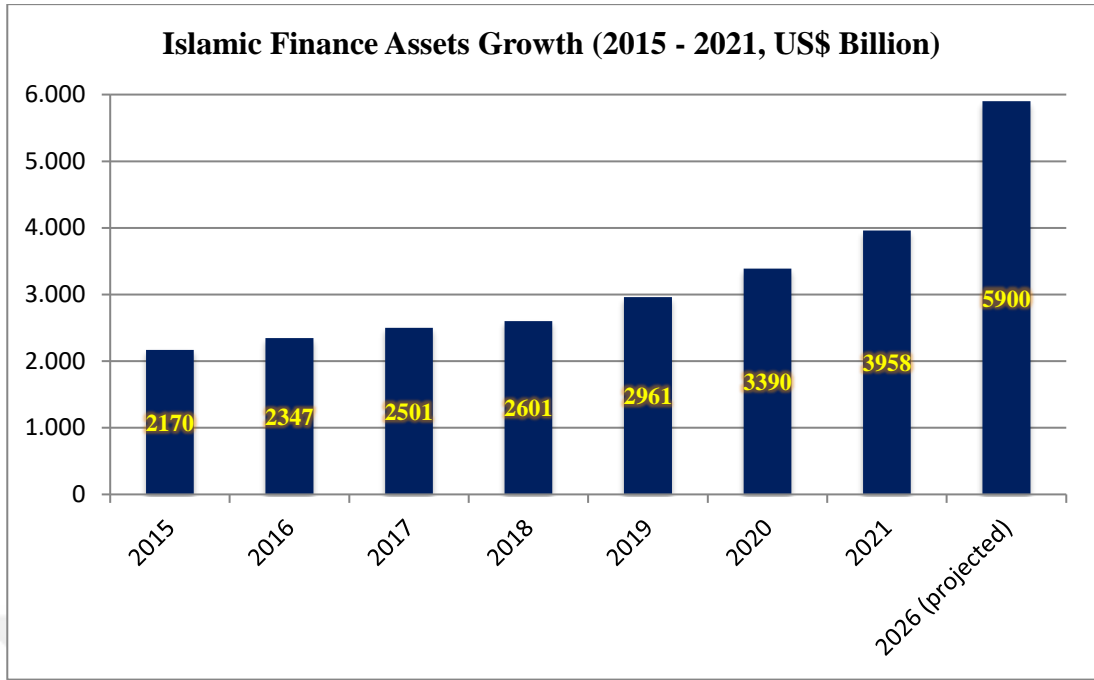
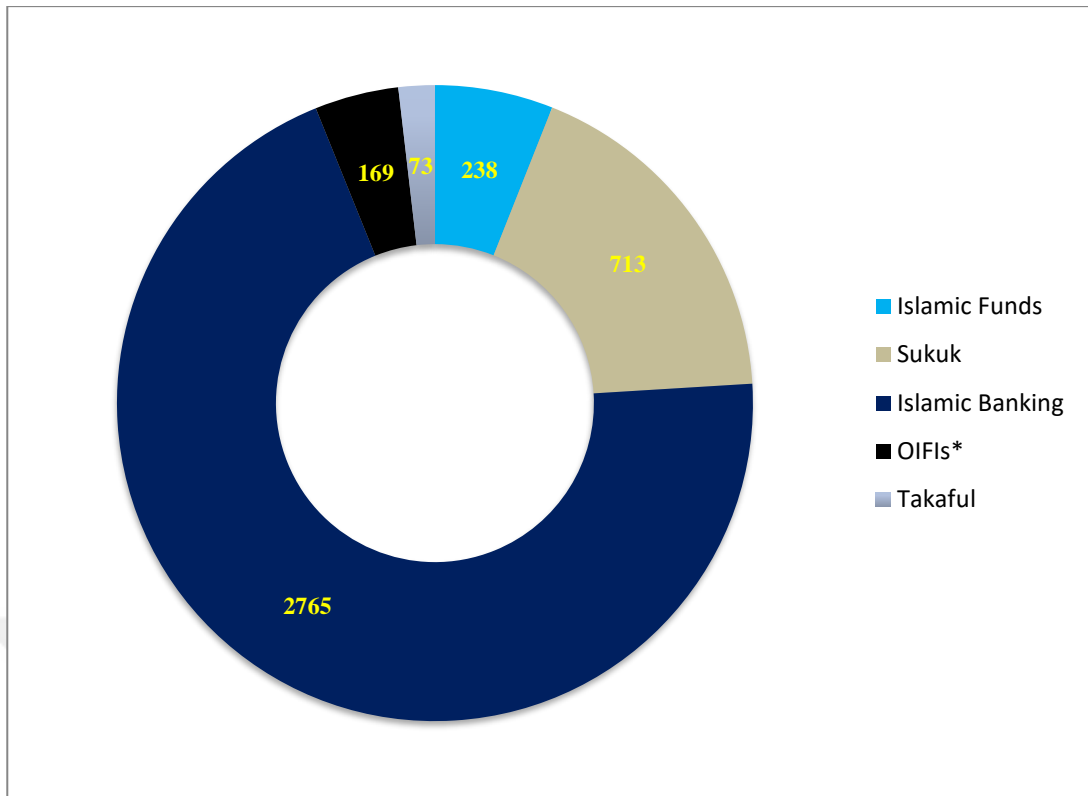


Figure 2.5: Islamic Finance Assets Growth (2015 - 2021, US\$ Billion).

Source: ICD report, 2022

The Islamic Financial Assets are keeping a steady pace in their annual growth, with an expected increase in rate after the recovery from the years of Covid-19 and the spread of the Islamic financial activities in the world with the help of the awareness sharing activities reported to reach 1053 number of Islamic event activities and 13 216 Islamic financial news, additionally to the share of Islamic finance knowledge through 880 Islamic Finance Education providers, 3504 Islamic Finance Research Papers Produced until now, and 124 Islamic Finance Journals (ICD – Refinitiv Islamic Finance Development Report 2022 Embracing Change, 2022).



***Other Islamic Financial Institutions.**

Figure 2.6: Islamic Finance Assets (2021, US\$ Billion).

Source: ICD report, 2022

(Aziz & Dowling, 2018) argues that a correct use of AI would save a trillion dollar for the financial industry by 2030. The impact of the Artificial intelligence on the Islamic finance and economic activities appears to be important, and the Chatbots, the smart contract and many other AI based tools, could be game changers in terms of the Islamic banking revolution.

The AI technology is usable in each of the front office, middle office, and back office, it would optimize the customer engagement, the growth of productivity thanks to atomization, 24h/7 customer services increase the customer satisfaction, efficiency, risk management and price reduce (Sarea et al., 2021)

Table 2.2: AI-based Banking Activities

| Front Office | Middle Office | Back Office |
|---|--|--|
| <ul style="list-style-type: none">• Chatbots• Facial Recognition• Voice Assistants• Biometrics | <ul style="list-style-type: none">• Document Digitalization• Loan Processing• KYC/AML• Legal compliance workflows | <ul style="list-style-type: none">• Credit underwriting.• Fraud detection• Smart contracts infrastructures• Risk Monitoring |

Source: Bhattacharya & Sinha, (2022)

McKinsey's global AI survey indicates that approximately 32 percent of the total AI technologies is implemented at the front-office and attributed to virtual assistants and conversational interfaces Bhattacharya & Sinha, (2022).

Certain AI-driven practices within these office domains were discussed as follows:

- **Front office:** Okechukwu & Majesty (2012) and Venkatraman & Delpachitra, (2008) stated through the study of Sarea et al. (2021) that by leveraging machine learning and face recognition-based biometrics, the system revolutionizes the (Know your customer) KYC process for retail clients. This technological solution empowers Islamic banks and financial institutions to verify customer identities online. Through the utilization of real-time picture capture and certified liveness programs, the system ensures that the person claiming the e-KYC is physically present and actively engaged in the transaction. Biometric signature authentication can be utilized to verify credit card applications and the opening of additional accounts. Banks can employ biometric technology to grant access to systems, devices, data, and other purposes. The utilization of biometric technology by banks is advantageous for both the banks and customers, as it enhances efficiency and aids in the detection of fraudulent activities.
- **Middle Office:** According to Hofmann et al. (2020) through Sarea et al. (2021), the utilization of AI in Islamic financial institutions can extend to various middle office tasks, including risk management, credit underwriting, and credit documentation. By incorporating 'Robotic Process Automation' (RPA) and leveraging existing data, Islamic banks and IFIs can enhance credit limit

monitoring, resulting in the creation of more efficient and expedited reports. This implementation has the potential to significantly reduce labour hours, leading to substantial time and cost savings. This utilization of RPA enables the optimization of human resources and the conservation of financial resources.

- **Back office:** AI plays a significant role in the back-office operations of Islamic financial institutions (IFIs). Its application in this domain can be categorized into two main areas: generic processing, which includes tasks like sales order processing, and its utilization in the insurance industry for processing insurance claims (Hassan et al., 2021). According to N. Khan (2020), Islamic banks employ AI in a range of back-office processes, including asset and wealth management, model risk management, market impact analysis, bank loan mortgage approval and processing, and capital optimization Sarea et al. (2021)

Kuwait Finance House, Dubai Islamic Bank, Qatar Islamic bank, and many more Islamic banks are applying the AI technology in some of their activities. One of the best examples of the AI demonstration in an Islamic bank is the pioneering Kuwait finance house in the digital banking revolution, as its online services rose by 40%. The Bank adopted a mixture of technologies, including AI and Fintech based innovations to offer online services through (KFHonline) application on mobile and as a website, where 135 million online banking transactions happened by its customers in the first half of 2023, which made them realise this rate of growth comparatively to the first half of 2022. KFH has collaborated with Microsoft to introduce its Chatbot service, aiming to enhance customer engagement. This service is accessible through various KFH channels, including KFH.com and the mobile app KFHonline. The institution provides a range of convenient features such as QR code payments, mobile banking, Civil ID cardless withdrawals, online information updates, activation of new and renewed debit cards, and PIN changes (*KFH Pioneer in Digital Banking Innovation, 2023*).

The Kuwaiti bank has made significant efforts in digitalizing its activities, such as the online payments accessibilities, online account opening, and card supplying with exclusive advantages. Additionally, it has enhanced its hardware capabilities allowing the entrance of innovative features to serve its customers by facilitating card printing

service instantly, as well as the gold trading and many other branchless activities. These efforts illustrate the will of KFH bank to please its consumers' ambitions while improving their banking services' quality, adjusting operational costs, and promoting the financial inclusiveness. Consequently, KFH has embraced the power of Robotics Process Automation (RPA) and Artificial Intelligence (AI) to enhance its digital banking services. As a result, customers can now enjoy seamless access to these services through a diverse range of alternative channels, including KFHGo smart branches, the KFHonline mobile application and website, self-service gadgets, and various social media accounts (*KFH Pioneer in Digital Banking Innovation, 2023*).

The UAE's largest Islamic bank, Dubai Islamic Bank (DIB), has long been at the forefront of the country's digitization efforts. It has consistently advocated for the use of technology to empower its customers and streamline the banking process. DIB's dedication to achieving its objective of becoming the foremost innovative financial institution on a global scale is clearly demonstrated by its various endeavors such as the introduction of paperless branches and the launch of a state-of-the-art Mobile App, respectively in 2014 and 2015. By offering digitally enabled solutions that cater to the needs of today's customers, DIB aims to provide a seamless and sought-after banking experience. (*Dubai Islamic Bank Introduces "Banking in Minutes" as It Enters the next Decade as a Digitally Intelligent Bank, 2019*).

The "Digitally Intelligent Bank" or "Banking in minutes" launched by the Dubai Islamic Bank is another AI based technology that supports the customers in their banking services. DIB's digital strategy was carefully designed to thoroughly analyse every stage of the customer experience, eliminate any obstacles that cause inconvenience to customers, and accomplish tasks that used to take days within a matter of minutes. Furthermore, customers who have been prequalified for a credit card can effortlessly apply for and obtain their credit card through the DIB Mobile App. They have the freedom to select their preferred card limit and card category and can immediately commence using the card via Apple Pay without any delay in receiving the physical card. This entire process can be completed within minutes. DIB's Sales Assisted Model, which incorporates digital intelligence, has significantly enhanced the preapproval and documentation submission process. By leveraging an electronic platform, customers can conveniently sign all contracts electronically, eliminating the need for traditional paper-based procedures. This digital

transformation has enabled DIB to successfully process an impressive volume of over 5000 personal finance applications and credit card requests through their app in a period of few months. (*Dubai Islamic Bank Introduces “Banking in Minutes” as It Enters the next Decade as a Digitally Intelligent Bank*, 2019).

Bahrain Islamic Bank (BisB) has recently announced the induction of its first digital virtual employee, "Dana" an AI based robot meant to revolutionize the Bahrain Islamic bank's services. Dana's primary role within the organization is to set benchmarks and implement inventive strategies, with the ultimate aim of ensuring the innovative simplicity of BisB's portfolio products and services. This strategic move perfectly aligns with BisB's overarching objective of simplifying customers' financial affairs, empowering them to effortlessly manage their daily transactions with unparalleled ease and convenience. "Dana" is set to assume the role of educating the public by presenting comprehensive details about the Bank's range of products and services. Through digital means, Dana will offer valuable advice and perspectives on Fin-Tech and financial trends, thereby assisting the Bank in enhancing its connection and communication with customers across BisB's digital platforms. (*“Dana” The First Virtual Employee Joins BisB Team*, 2019).

2.3 AI adoption in Moroccan Islamic banking:

From the research of Daradkah & Miani (2015), as cited in the official website of the central bank of Morocco Bank Al Maghrib (BAM), the origins of the banking sector in Morocco date back to the early 19th century, notably in 1906 when the Algeciras Act was enacted. This pivotal agreement involved the collaboration of 13 countries, comprising 12 European nations, the United States of America, and Morocco. Subsequently, the State Bank of Morocco was founded in 1907 to act as the financial intermediary for the Moroccan government and to manage the issuance of banknotes. More banks were created afterwards as the following timeline shows:

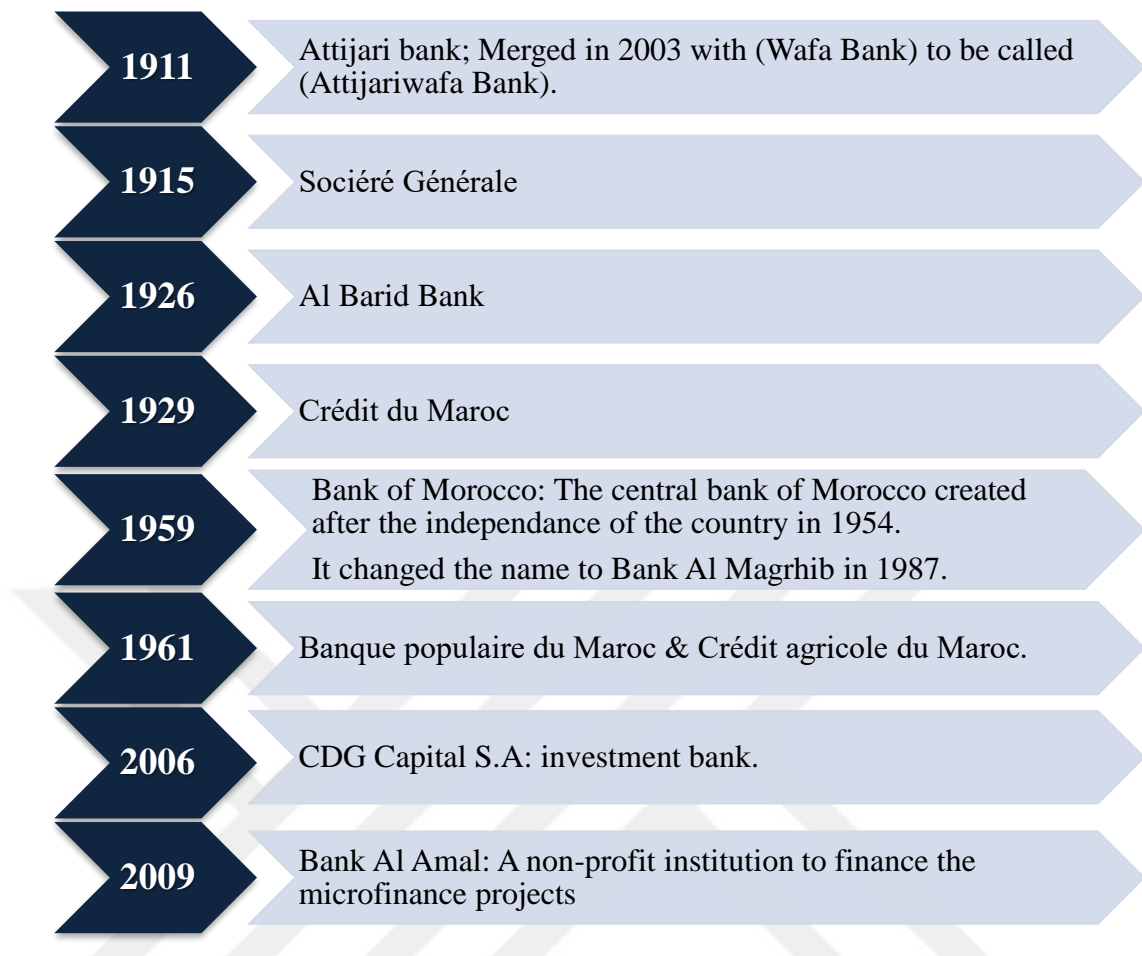


Figure 2.8: Key events in the history of Islamic banks in Morocco.

Source: Daradkah & Miani (2015)

The Islamic financial sector has known a unique evolution while overcoming a load of crises and challenges in these last years. The artificial intelligence played a crucial role in this growth, forasmuch it was being used in the pillar activities of the discussed sector, namely *Zakat* (a defined tax paid by the Muslims), Islamic banks, *Qardul Hassan* (Loans based on the benevolence of the borrower and returned with 0% interest), *Waqifs'* foundations or individuals etc....

In the year 2017, the central bank of Morocco issued a press release, announcing the establishment of the initial five participative banks and three participative windows (Ummia Bank, Bank Assafa, Bank Attamwil wal Inmae (BTI Bank), Bank al Yousr, Alakhdar Bank, Bank Nejma, Bank Arrida, Dar Al Aman). This significant development marked the approval for engaging in participative banking activities within the country. (*BANK AL-MAGHRIB - Banque Participative*, n.d.).

- Umnia Bank: Partnership between CIH (Credit Immobilier et Hôtelier) bank and QIIB (Qatar Islamic International Bank) bank.
- Bank Assafa: Previously Dar Assafa, was created by Attijariwafabank as the first independent bank totally dedicated to the Islamic called alternative banking products operating in 2007.
- Bank Attamwil wal Inmae: Called nowadays, BTI Bank, created from the partnership between Bank of Africa – BMCE Group, and Al Baraka Banking Group.
- Bank Al Yousr: Created by the BCP (Banque Centrale Populaire) partnership with the Saudi Group Guidance.
- Al Akhdar Bank: Established by the strategic partnership between Crédit Agricole du Maroc group and the ICD Islamic Corporation for The Development of The Private Sector, member of The Islamic Development Bank (IsDB) Group.
- Bank Najmah: The retail Banking Corporation BMCI (Banque Marocaine pour le Commerce et l'Industrie) a majority-owned subsidiary of the French financial group BNP Paribas, launched its participative window BMCI NAJMAH.
- Bank Arreda: A participative window established thanks to the partnership between CDM (Crédit du Maroc) and Crédit Agricole S.A. (France).
- Dar Al Amane: A participative window created by the Moroccan subsidy (Société Générale Maroc) of the French Financial services company SocGen (Société Générale S.A.).

However, the strive to introduce the Islamic finance to the Moroccan financial sector started in 1980s, where many financial institutions approached monetary authorities to establish the first cornerstone of Islamic finance in the in the country, beside the attempt to settle the first Islamic bank in Morocco “Wafa Bank” in 1985. The last decade of the 20th century didn’t witness much effort to establish an Islamic banking system in the country, as there are no important events related to the topic in the historical record in those years, aside from the year 1991 when “Wafa Bank” made the initial endeavor to offer Islamic financial – alternative – products, that were ultimately abandoned due to legal challenges, according to (Rhanoui & Belkhoutout, 2017).

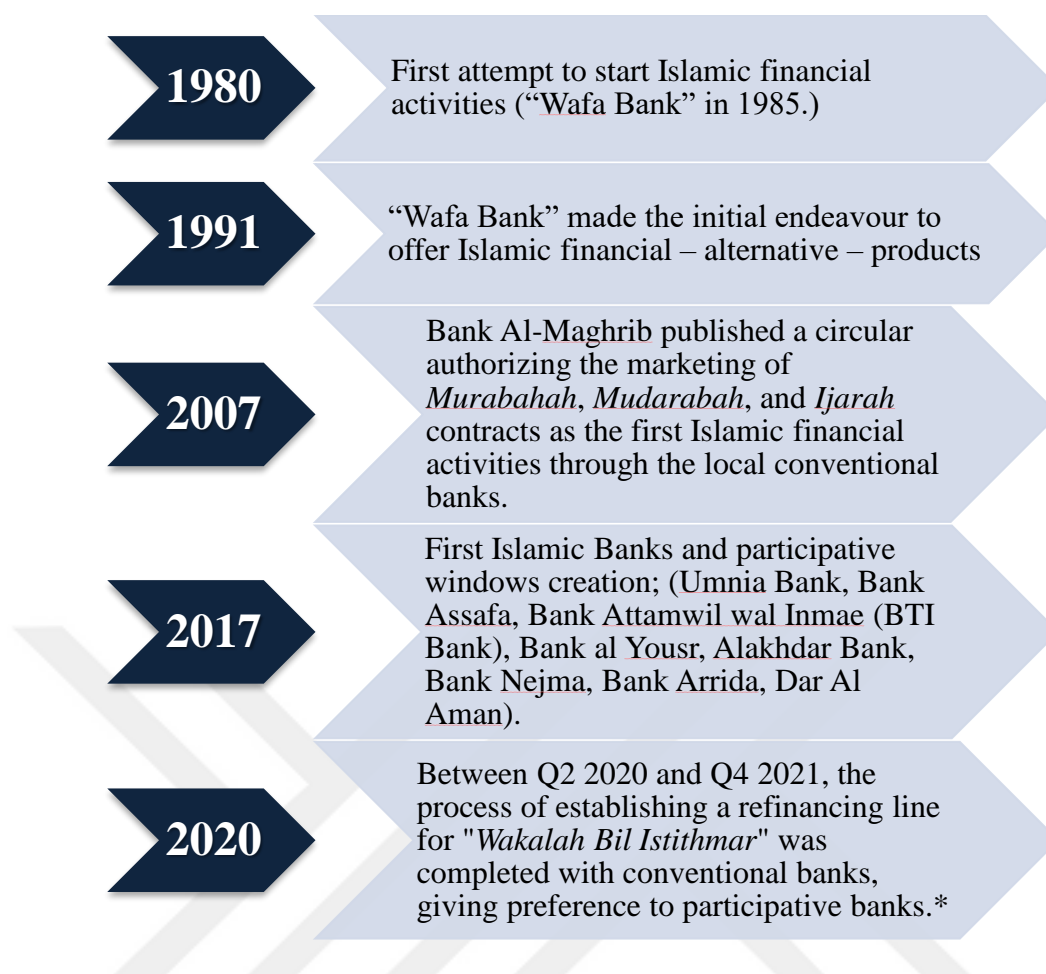
Moreover, in the beginning of the 21st century the first Shariah based financial activities occurred after the published circular of Bank Al-Maghrib in 2007 authorizing the marketing of *Murabahah*, *Mudarabah*, and *Ijarah* contracts through the local conventional banks, succeeding the promulgation of the banking law (law n°: 34-03) in 2006 (Chihab et al., 2019).

Nevertheless, this endeavour proved unsuccessful due to various factors; firstly, there was a lack of consensus regarding the compliance of these products with *Shariah* principles among the religious authority known as the Superior Council of Ulemas. Secondly, as the Moroccan Central Bank (Bank AL-Maghrib) had imposed a ban on any religious references, thereby forbidding the use of the label "*Halal*" in all advertising activities, the marketing of these products was problematic (El Mallouli & Sassi, 2022). Yet, to overcome this specific detail, the term of alternative products was adopted rather than Islamic product.

Furthermore, El Mallouli & Sassi (2022) cited their study in 2020 saying that the promotion of these products was carried out via conventional banks, regarded by Moroccans as interest based financial institutions, which leads to the conclusion that dealing with these products does not adhere to the principles of *Shariah*. The third reason is the excessive price of the produced contracts, mainly due to the lack of tax neutrality.

The authors mentioned the example of Attak (2018) who mentioned that the conventional banks' loan is on a reduce rate of 10% while the *Murabahah* contract' value added tax reaches 20%. The final limitation is related to the banks' insufficient implication and advertising tools, alongside the lack of Islamic financial specialists among the employees. (El Mallouli & Sassi, 2022).

Bank Al Maghrib has taken significant steps to enhance its internal capabilities and knowledge in the field of participative banking, by creating training program and forming alliances with multiple international organizations that specialize in supervising and regulating the participative finance sector. Also, the 2010 financial law applied new measures linked to the taxation of *Murabahah* contracts, guaranteeing their tax neutrality (El Mallouli & Sassi, 2022).



***From the Annual Report of Bank AL MAGHRIB (Central Bank of Morocco)**

Figure 2.9: Key Events in the History of Islamic Banks in Morocco.

Source: Author

The Moroccan authorities derived valuable lessons from their initial unsuccessful experience and modified the regulatory framework in a way that fosters the growth of the Islamic banking sector in Morocco. Consequently, in the year 2017, this latter sector witnessed a fresh start with 8 new participative banks and windows, as named previously, but only dealing with a limited set of services including *Murabahah*, and *Mudarabah* contracts.

A study based on the SWOT analysis of the Moroccan market exposes an absence of economy of scale, a political stability as well, plus an economical growth within a legal and administrative environment ready to acquire the Islamic financial actors plus the fact that there is no *Shariah* committee that could rule the nature of the transactions alongside the lack of expertise and qualifications in Islamic financial domain. (Chihab et al., 2019)

Until this day, the Moroccan Islamic financial sector is still uncomplete, with the absence of the several Islamic products, but the numbers realised by Moroccan participative banks from their first creation in 2017 up until 2023 are huge and important, as it is shown in the following data from Bank AL MAGHRIB's indicators:

Table 2.3: Number of Agencies and Current Accounts

| | December 2021 | December 2022 | August 2023 | % Annual variation |
|---|------------------|------------------|----------------|-----------------------|
| Participative banks and windows network (branches) | 176 | 190 | 196 | 5,9% |
| Number of current accounts | 151 522 | 185 266 | 220 456 | 27,8% |

Source: Bank AL MAGHRIB

Table 2.4: Customer deposits' amount

In thousands of Dirhams

| | December 2021 | December 2022 | August 2023 | % Annual variation |
|---------------------------|------------------|------------------|----------------|-----------------------|
| Demand deposit | 5 275 435 | 7 015 086 | 7 895 810 | 33,5% |
| Investment deposit | 1 721 623 | 2 306 499 | 2 777 033 | 26,1% |

Source: Bank AL MAGHRIB

Table 2.5: Participative financing

In thousands of Dirhams

| | December 2021 | December 2022 | August 2023 | % Annual variation |
|---|------------------|------------------|-------------|-----------------------|
| Participative financing through <i>Murabahah</i> | 19 256 731 | 23 411 558 | 26 454 480 | 19,5% |
| • <i>Murabahah</i> for real estate | 17 030 655 | 20 193 754 | 22 262 011 | 15,5% |

| | | | | |
|--|------------|------------|------------|--------|
| • Murabahah for cars | 1 365 159 | 1 360 564 | 1 478 888 | 0,9% |
| • Murabahah for equipment | 860 916 | 1 857 240 | 2 713 581 | 93,6% |
| Participative financing through Murabahah, excluding registered margins | 14 030 718 | 17 389 332 | 19 968 899 | 23,5% |
| • Murabahah for real estate | 12 104 651 | 14 610 469 | 16 359 207 | 18,9% |
| • Murabahah for cars | 1 178 308 | 1 177 844 | 1 281 513 | 1,1% |
| • Murabahah for equipment | 747 759 | 1 601 019 | 2 328 179 | 102,7% |
| Salam financing | 20 580 | 104 752 | 188 940 | 213% |

Source: Bank AL MAGHRIB

As it is observed, the indicators are scoring a considerable growth annually, especially the big jump of *Salam* financing with a 213%, which promise a bright future of Islamic financing in the Moroccan market.

On the other hand, the traditional segment remains the dominant force within the industry, boasting even more substantial figures and rates, as evidenced by the Moroccan Centrale bank's website and annual reports. The subsequent section will provide a more comprehensive analysis of these reports. Consequently, Islamic banks are compelled to enhance their performance in order to swiftly catch up with their conventional counterparts.

According to the IFSB “Islamic Financial Services Industry Stability Report 2023”, the Moroccan Islamic Banking Share in Total Banking Assets by Jurisdiction in 2022 was by 2%. (Islamic Financial Services Industry Stability Report, 2023).

The financial newspaper “La vie Éco” stated in its review “Banques participatives: Rentabilité pour 2023” that the Participative banking sector reached 21.5 billion DHs (Approximatively 2.2 billion US dollar) in June 2022 with an annual growth of 96% between 2018 and 2022.(Hafidi Mohamed A., 2022)

The expectation of Moroccan banks to witness growth in their Islamic deposit bases is indeed a welcome development. Projections indicate a potential increase of 5-10%, which is anticipated to provide a modest stimulus to the country's economic

development. Fitch Ratings, a reputable rating agency, has highlighted that deposits constitute approximately 70% of the funding in the banking sector. Despite this, Fitch Ratings also highlighted that participation banking is unlikely to significantly impact the market share of well-established conventional banks. This is primarily due to the fact that Moroccans, in general, have not refrained from participating in the banking sector based on religious beliefs. In fact, a substantial 70% of adults in Morocco possess a banking account (Vineeta Tan & et al, 2018).

In Morocco, the integration of AI technologies into the banking sector brings forth a multitude of financial benefits, as they will play a crucial role in enhancing the caliber, scope, and profitability of the provided services and goods. Additionally, it empowers the competitiveness within the country's banking sector along with the position of Moroccan banks not only in Africa, but also in the international market. Nevertheless, the absence of a well-defined legal framework for AI technology and its associated algorithms may present a significant obstacle to the extensive adoption of this technology (Ouidani & Oulcaid, 2023).

The utilization of artificial intelligence remains limited among many companies in Morocco, as they are primarily involved in the "data engineering" stage. It is the preliminary phase towards the eventual implementation of an artificial intelligence system, where all the focus is centered on gathering, digitizing, ensuring accessibility, and analyzing data. The level of maturity necessary to embrace artificial intelligence technologies is not yet uniformly attained by all industries in the country. According to (Ait et al., 2020), insurance and banking sector are the most adaptable to the technological revolution (Ouidani & Oulcaid, 2023).

The Centrale bank of Morocco and some conventional banks started to use this technology for different purposes. (Bank of Africa) is determined to solidify its position as a frontrunner in digital banking within Morocco and Africa. To achieve this, the bank has embarked on a digital transformation program that encompasses several key components, including Blockchain, Fintech partnerships, artificial intelligence, and mobile payment solutions. This strategic commitment to embracing multiple channels is evident through the restructuring of organizational processes and the introduction of innovative products and services that are tailored to meet the evolving expectations of customers (remote banking, extended branch opening hours, electronic banking, self-service banking, dematerialization, etc.). The bank introduced

the French and Arabic version of its chatbot named KODI at the beginning of 2020 (*Le Chatbot Kodi: Une Innovation Made in Bank of Africa*, 2021).

Attijariwafa bank has recently unveiled a chatbot that is conveniently accessible and readily available on its institutional website. This cutting-edge technology offers a 24/7 online help service, catering to the needs of customers at any time of the day. This virtual assistant, powered by artificial intelligence, enables customers to engage in interactive conversations and promptly receive accurate answers to their inquiries. It offers a convenient and efficient solution, allowing customers to seek assistance at their convenience (Ouafaa Ghaouat, 2020).

The subsidiary of Bank of Africa (previously BMCE Bank) called “Salafin” integrated an AI-based anti-fraud system and successfully detected approximately 700 realistic fraudulent activities in 2017. “Salafin” institution provide financing options for consumer credit and vehicle purchases to individuals and SMEs (Ait et al., 2020).

The examination of various papers on the Moroccan sector reveals a notable absence of any mention regarding the incorporation of AI in Islamic banks in Morocco. In contrast, there have been indications of the implementation of this technological innovation in some conventional banks. However, it would be premature to definitively state that AI is completely absent in these institutions. This is because contemporary AI-based applications like ChatGPT and Canava are extensively used not only by organizations but also by individuals, including employees within the Islamic banking sector in the country. In the findings section, a more detailed discussion of this conclusion will be presented.

2.4 Challenges of adopting AI by the Moroccan Islamic banks:

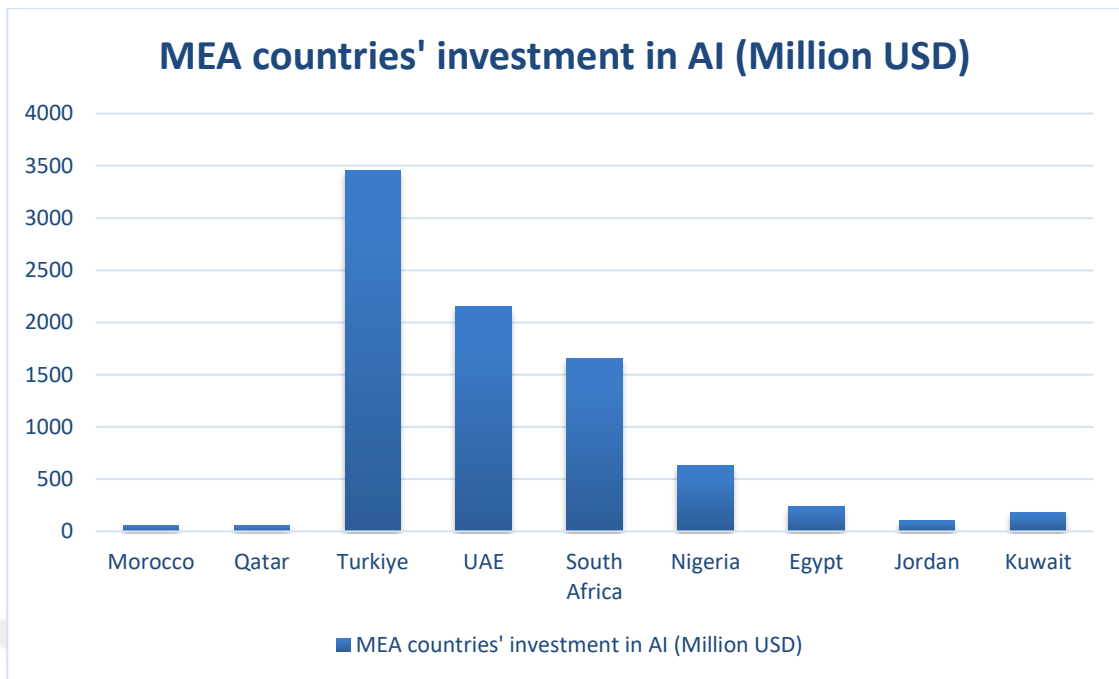
Notwithstanding the number of benefits that are brought by the AI machinery, there are also significant challenges that can impede its effective implementation and utilization withing the Islamic banks in Morocco and other countries.

AI may require personal information on the banks’ customer or employees, which could be perceived as a privacy violation. This is one challenge among several others that puts the use of this particular technology in banks more defying than expected. Besides, Hasan et al., (2020) argue that meeting the millennial population’s increasing demands poses one of the biggest challenges for the finance industry, including the Islamic finance sector. Academicians enumerated a list of challenges such as the task

of selecting the appropriate data and algorithm, integrating AI into business operations, the predictive active accuracy of algorithms, and the lack of skilled personnel in dealing with AI. (Sarea et al., 2021).

According to Wilson et al. (2017), a study conducted on the top 1000 firms in the United States revealed that the employees' proficiency and readiness to comprehend and work with AI is their primary concern when introducing this new technology. Lynn et al. (2019) added that the process of training a competent workforce is a time-consuming endeavour. Nevertheless, Goldman Sachs and other firms have taken steps to mitigate this issue by creating a campus in India that can house up to 7000 employees. This strategic decision was influenced by the abundance of skilled individuals in the Indian workforce.

Ait et al. (2020) mentioned the Moroccan weak investment dedicated to artificial intelligence vis-à-vis the other Middle East and African countries according to the statistics projected by a Microsoft's study done in 2019. The statistics showed a 57 million US dollars for 7 transactions invested by Morocco in AI, compared to a 1658 million US dollar for 137 transactions realised by South Africa, 630 million US dollar for 87 exchanges by Nigeria, and Egypt with a 241 million US dollar for 100 deals. In the Middle East, Türkiye leads the list with a huge 3459 million US dollar for 252 agreements, UAE invested 2151 million US dollars for 160 deals, and finally Jordan and Kuwait investing respectively 100 and 177 million US dollars. The only country below Morocco in the list was Qatar with a 52 million US dollars AI investment.



Picture 2.3: The Middle East and African countries’ investments in Artificial Intelligence (2019 Microsoft study).

Source: Ait et al. (2020).

The need for artificial intelligence technology rises also from the urge to develop the cybersecurity level in such important institutions, with the increase of cyber-attacks and hackers’ crimes around the digital world. Numerous challenges arise for banks during the implementation of AI-powered systems, as highlighted by several experts.

AL-Dosari et al. (2022) studied the impact of AI on the cybersecurity in Qatari banks and found out several challenges, among them: A recurring issue that garnered attention was the development of AI-based security systems within the organization. The local development of AI software is not feasible, partly due to the limited availability of highly skilled professionals. Moreover, training employees emerged as a major obstacle in effectively utilizing AI-powered systems. Furthermore, there is a concern that criminals may have access to sensitive security information. Additionally, banks in Qatar face the challenge of integrating innovative AI-powered solutions with their legacy systems.

In addition, Rahman et al. (2021) conclude from their studies that the major challenges restraining a successful use of the artificial intelligence are the shortage of skilled professionals, alongside adequate IT infrastructures, data security and privacy, and the absence of regulatory requirements.

The current applications of AI by the International Islamic banks and the Moroccan conventional banks are promising a bright future to the banking sector in Morocco. Thus, a regulatory framework should be established in the country to conceive the utilization.

In general, there are several hurdles that Islamic Fintech firms must overcome, and regulatory challenges are among the most pressing. To facilitate the advancement of this sector, policymakers need to create a regulatory environment that is conducive to its growth. (Firmansyah & Anwar, 2019).

Bachir & Marzouki (2023) stated that Morocco is required to intensify its endeavors in enhancing the security measures and defense mechanisms of its information systems. Additionally, it is crucial for Morocco to establish a legal and regulatory framework that addresses these concerns. Furthermore, Morocco still needs to foster the development of human expertise in this field, individuals who possess the capability to analyse and comprehend technological techniques, as well as effectively manage computer security services and systems. To achieve this, it is essential to prioritize the education sector's alignment with the industry's demands.

On another front, the absence of transparency presents a significant obstacle to both economic growth and the progress of artificial intelligence tools. In Morocco, the lack of information transparency encompasses various sectors, including businesses, financial markets, public institutions, and non-governmental organizations (Bachir & Marzouki, 2023).

The African countries suffer certain disadvantages in implementing innovative assets rather than Artificial Intelligence itself, such as the lack of dependable mobile networks, the high costs of services, and the slow bank's processing of clients' requests. Furthermore, the extensive misuse of digital tools, such as cell phones and the Internet, for fraudulent purposes, poses a significant risk to the economic stability of several African nations, both at the national and international levels (Ouidani & Oulcaid, 2023).

The same study points out the rate of illiteracy in Morocco, citing that it reached 35,9% in 2019 according to a survey published by HCP "Haut-Commissariat au Plan". The discussed issue is an obstacle for the country overall to realise a steady growth in terms of the technological revolution as this latter requires a certain base of education level

to be able to learn it and use it withing the enterprises' activities. Thus, one of the major challenges that the banking sector could face is the composition of future teams with highly talented members in the digital related domains. Nevertheless, it cannot be denied that this technology brings forth legal challenges related to the absence of a proper legal framework and the safeguarding of customers' personal data. This vulnerable domain requires adequate protection (Ouidani & Oulcaid, 2023).

Likewise, El Mezraoui, Lotfi & Bouthir (2013) listed a set of challenges that impeded the flourishing of the Islamic banking activities in Morocco as stated in the research of (Chihab et al., 2019):

- The engagement of the bank in a dual transaction involving the purchase contract and subsequent resale to the customer, along with the absence of concurrence given the fact that only one bank ventured into marketing these products, while the others opted to wait for demand to emerge.
- The lobby of banks was another challenge that hindered the commercialization of these emerging products, and the establishment of Islamic banks.
- The absence of any political drive has been evident in tackling the matter at hand.
- Deficiency of expertise and training related to the domain.
- Insufficiently robust marketing strategies do not adequately support the aspirations to grow these activities.
- Lack of awareness from the *Shariah* Scholars called *Ulemas*.

Artificial intelligence is currently revolutionizing the world, introducing a whole new paradigm where "machine learning," "deep learning," "neural networks," and other cutting-edge technologies will shape global affairs. The widespread adoption of artificial intelligence will no longer be an exception, but rather the norm. Nevertheless, this technology presents various challenges that necessitate a continuously evolving regulatory framework, especially when it comes to addressing the ethical concerns it raises. Furthermore, the regulation of algorithms remains a complex task due to the dynamic nature of the technology and the confidential and competitive nature of its advancements.

Morocco is expected to witness a significant increase in the implementation of artificial intelligence across various sectors in the coming years. Artificial intelligence, which relies on imitating human intelligence through the creation and application of

algorithms, holds great promise and presents a tremendous opportunity for the country. However, it is crucial to lay the groundwork for the adoption of this technology and actively contribute to its development in both the public and private sectors.

In fact, the Moroccan Islamic banking sector demonstrate an outstanding growth within the banking industry in nearly seven years today, regardless of the gaps that should be addressed. From the “Mit Ghamr Bank” creation in 1963 up until this year, the Islamic banking sector completed six decades of growth in the banking industry worldwide, and the statistics are promising for more development in the next years. Hence, the adoption of technology in general, and specifically Artificial Intelligence, could act as a catalyst for the overall progress and hold great potential for the future of Islamic banks within the banking industry.

2.5 Chapter Summary and Discussion:

This chapter revolved around the existing literature review debating the evolution of technology in the banking system, a global overview of integrating AI in Islamic banks and then in Moroccan banking industry, and lastly the challenges hindering this endeavor in the Moroccan Islamic banks. Furthermore, it explored the challenges that are obstructing the successful implementation of AI in Moroccan Islamic banks.

The authors outlined the emergence of Fintech and Artificial Intelligence in the banking industry, emphasizing their potential benefits and promising impact. Their arguments were supported by statistics, which revealed significant expected revenue and value to be generated in the upcoming years. Moreover, the examples of AI utilization in banks such as BBVA and Bank of Tokyo further illustrate the advantages of integrating such innovations in the banking sector. However, as noted in (Tiwari et al., 2022), it is essential to consider three indispensable elements: responsibility, accuracy, and credibility. Additionally, in the context of Islamic banking, *Shariah* compliancy should also be taken into account. Besides, the discussed endeavor requires significant capital and expert handling, posing various difficulties for banks in terms of the costly investment, as well as the guarantee of data security and privacy, etc....

Several major Islamic banks in the Middle East, including KFH, DIB, and BisB, have been at the forefront of implementing AI technology. This indicates that the Islamic banking system overall, are already experiencing the AI innovation through their own

Chatbots, AI-based virtual employee (Dana for BisB), as well as various AI and Fintech based services such as "Banking in minutes", online platforms, and applications that have digitalized numerous services including online payments, account opening, consumer orientation, and credit card issuance, etc....

In Morocco, three prominent conventional banks in the country's sector have taken the initiative in implementing AI-powered Chatbots and anti-fraud system. Conversely, the Moroccan Islamic banks have not yet embraced this specific innovation. Overall, the sector shows promising strides but requires further legal and industry-wide support for comprehensive AI adoption. The integration of AI into banking systems, especially within Moroccan Islamic banks, is fraught with various challenges as highlighted by the authors. These challenges primarily center around issues related to investment, the critical need for a regulatory framework to guide AI deployment, the importance of human expertise, and the existing technological and infrastructural barriers in the country. Additionally, some authors underscored the considerable cybersecurity threats faced by Islamic banks in Morocco, given their relatively recent establishment in the industry.

CHAPTER III

METHODOLOGY

In this chapter, the research methods employed to fulfil the objectives of this thesis is discussed. The conduct of this latter will be based on both primary and secondary data, extracted respectively from semi-structured interviews and literature reviews. This chapter is divided into six sections after the introductory paragraph, the first one contains an overview of the research design, the second section will focus on the use of a comprehensive literature review to answer the questions of the study, the third section is spared for the semi-structured interviews part as a primary data source to assist the secondary data for this qualitative study, the fourth projects the interview questions, and the last section summarizes the chapter.

3.1 Research Design:

An important step in conducting research is determining whether a quantitative or qualitative method is best suited to the study. The more important issue, however, is determining the research design. Methodology is only one component of a paradigm within which researchers work either explicitly or implicitly (Sobh & Perry, 2006). The philosophy of research explains why quantitative, qualitative, or mixed methods are used in a particular study. The research philosophy reveals the general philosophical orientation of the research about the world and the nature of research. At least three factors influence research philosophy: discipline orientations, researcher inclination, and previous research experiences (Creswell, 2014).

In the literature, the most widely debated philosophical schools are positivism, constructivism, and pragmatism (Creswell, 2014). Positivism advises researchers to accept the world's reality as well as our ability to investigate the realities that exist within this real entity (Walliman, 2022). This philosophy is more in line with quantitative approaches to data collection and analysis (Mackenzie & Knipe, 2006). Constructivism, on the other hand, asserts that individuals 'construct' their world, which could be the driving force behind any social science investigation (Sobh & Perry, 2006). Pragmatism is an approach in which the researcher focuses on the

problem rather than the method (Creswell, 2014); thus, for a better understanding of the problem, the strengths of both approaches are combined (Morgan, 1998). Research Methodology is based on three approaches Quantitative Qualitative and Mixed method.

Quantitative research design refers to logical procedures for collecting, analysing, and reporting numerical data in order to provide effective answers to a set of predefined research questions and test hypotheses in relation to some definite variables (Creswell, 2014).

On the other hand, qualitative research is an attempt to investigate and comprehend the meaning that people ascribe to a specific social or human problem. In a qualitative study, questions and procedures emerge, data is gathered within the participants' settings, data is analyzed inductively, building from particulars to broad themes, and finally the researcher interprets the data's meaning (Creswell, 2014). The present study is based on a qualitative research design, using semi-structured interviews for a primary data, and literature review for the secondary data.

The mixed method, which combines the qualitative and quantitative methods, answers questions using both methods' techniques (Williams, 2007). Detailed information regarding study design is crucial in quantitative research to enable replication, verification, and reassurance. On the contrary, qualitative research often neglects study designs and other structural components, making replication of study designs exceedingly difficult. Consequently, the failure to replicate study designs hampers the ability to produce replicable findings.

3.2 Population and Sample Size

A population is defined as the entire collection of individuals with particular traits, whereas a sample is a smaller, selected group from the population. (Banerjee & Chaudhury, 2010)

This work focuses on a homogeneous population that are considered experts in the field of Fintech and Islamic finance belonging to the same geographic area, notably the Kingdom of Morocco. Ten interviewees were chosen from different Moroccan organizations as sample of this thesis, detailing the sampling technique in the following part.

In the study of Sandelowski (1995), the opinions of commentators indicate that a sample size of ten could be considered satisfactory for qualitative research, particularly when sampling from a population that exhibits homogeneity.

For the diversity, the participants for the interview will be selected from different roles and positions within the Islamic banks and institutions (Islamic finance consulting groups) of Morocco, it will help enriching the study with a diverse range of perspectives. Also, the professionals in the Artificial intelligence technology are targeted for the interviews to vary the data and explore different views from two domains, namely, banking and technology, that are set to be combined under the theme of integrating AI in Islamic banks, precisely in Morocco for the purpose of serving the thesis subject.

The banking sector was specifically chosen due to its emergence, substantial size, and critical significance in the Moroccan state. This is particularly noteworthy as AI applications in the financial sector have far-reaching implications and present tremendous benefits and opportunities.

The qualitative findings from the literature study and interviews will be combined to build a cohesive narrative capturing the varied characteristics of Moroccan Islamic banks managing the hurdles and capitalizing on the opportunities given by the AI era.

3.3 Sampling Techniques

The questions designed for the interviews demanded a particular understanding of Islamic finance and technology, leading to a non-probability purposive sampling technique based on the expertise of the individuals alongside their willingness and availability to attend the meeting.

(Palinkas et al., 2015) deduced from several studies (Patton (2002), Creswell & Plano Clark (2011), Bernard (2002), and Spradley (1979)) that the technique of purposeful sampling holds great significance in qualitative research as it enables researchers to efficiently utilize limited resources by selecting cases that offer substantial information. This method involves the careful identification and selection of individuals or groups with extensive expertise and professionalism in relation to a particular phenomenon of interest. Furthermore, the readiness and accessibility to participate, coupled with the capability to proficiently convey experiences and

opinions in a coherent, expressive, and introspective manner, are pivotal factors to take into account.

The interviewed experts were either suggested by professionals providing their WhatsApp contact information or were contacted through LinkedIn App. The selection criteria involved filtering the search to experts in Islamic banking in Morocco, the Islamic financial sector, and technological domains, with a particular focus on fintech and artificial intelligence expertise.

3.4 Research Instruments

A research instrument serves as a methodical and scientific device utilized for the purpose of gathering, assessing, and interpreting data that is pertinent to the research focus and objectives. Researchers are tasked with choosing the most suitable instrument for their study, taking into consideration whether it is quantitative, qualitative, or a blend of both approaches. Various types of research instruments include surveys, tests, questionnaires, and so forth (Oben, 2021).

This research is founded on a semi-structured interview method employed to gather valuable insights from the selected experts. The interview questions were chosen to serve the three main objectives of the study which are:

- To examine the state of the art of the technology adoption in Moroccan Islamic Banking.
- To investigate the challenges faced by Moroccan Islamic banking in adopting AI.
- To examine the prospects and future strategies for enhancing AI adoption in Moroccan Islamic Banking.

The interviews were conducted via online platforms such as Zoom or WhatsApp, utilizing both video and voice calls. The duration of each interview ranged from a minimum of 40 minutes to a maximum of 75 minutes. Besides, two out of ten interviewees opted to submit their responses in the form of voice recordings on WhatsApp, citing their unavailability for a live interview. However, the remaining experts actively engaged in the interviews, dedicating their time to answer the questions thoughtfully and share their perspectives on the discussed topic. This created an environment conducive to constructive debates, fostering the emergence of innovative ideas to enhance the study.

3.5 Data Collection

3.5.1 Primary Data: Semi-structured Interviews

During the process of conducting interviews, researchers have the flexibility to utilize three distinct interview techniques: structured interviews, unstructured interviews, and semi-structured interviews. (Creswell, 2014; Sekaran, U. and Bougie, 2013).

According to Kvale (1996) through the study of (Mashuri et al., n.d.), the interview is commonly understood as a form of interaction occurring between two individuals during a specific occasion. Within this context, one person takes on the role of the interviewer, while the other assumes the position of the interviewee. As a result, the interview can be defined as a mutual exchange of perspectives, where two individuals engage in a conversation revolving around a particular theme or topic of interest. From a broader perspective, the interview can be regarded as a type of dialogue involving multiple participants, including both the interviewers and the interviewees, with the primary aim of gathering information through the process of questioning. (Mashuri et al., n.d.)

Table 3.1: Characteristics of The Three Interview Models

| Structured interview | Semi-structured interview | Unstructured interview |
|---|---|---|
| Non-continuous speech following the order of the asked questions | Speech conducted by themes following the responsiveness of the interviewee in determining the order | Continuous speech |
| Question prepared in advance and asked following a specific order | Some reference points (obligatory passage) for the interviewee | No questions prepared for the interview |
| Partial and reduced information | High quality information, orientated for the project's goal | Very high-quality information, but not necessarily relevant |
| Information collected in a fast way | Information collected within a reasonable time frame | Information collected in an unpredicted duration |
| Fairly weak inference | Moderate inference | Inference exclusively depending on the method of collection |

Source: (Imbert, 2010).

This thesis will be based on a semi-structured interview, conducted with professionals and researchers in the sector of Islamic banking and the artificial intelligence.

In their research, Magaldi & Berler (2020) refer to the semi-structured interview as an investigational interview technique. They emphasize that this type of interview is typically guided by a predetermined structure and revolves around a central topic, providing a general framework. Furthermore, the authors assert that despite the predetermined areas of discussion, the semi-structured interview enables researchers to delve deeper into uncovering new insights and discoveries.

This type of interview allows the researcher to lay out the questions according to the study's three themes. Additionally, it frees the interviewee from any restricted outlines and grants him the opportunity to express his various thoughts while answering the questions spontaneously. The interview was designed to examine the occurring situation of AI use in Morocco's Islamic banks, the challenges of this implementation, and the prospects awaited afterwards.

3.5.2 Secondary Data: Comprehensive Literature Review

The methodology of Comprehensive Literature Review (CLR) serves as an approach that can be utilized independently or as a means to guide the primary research at different points throughout the research journey. It utilizes a blend of various research methodologies, covering culture, ethics, and multimodal texts and contexts, in a methodical, all-encompassing, harmonious, and repetitive manner. Through the exploration, interpretation, synthesis, and communication of published and unpublished information, this approach facilitates a comprehensive understanding of the subject matter. (Onwuegbuzie & Frels, 2016: 4).

This study is based on a qualitative method with insight derived from comprehensive literature that has been done so far in the context of Islamic banking and artificial intelligence, for the detailed literature review various data bases like as Google Scholar, Scopus, Web Of Science and Research Gate, etc., will enhance the study and will provide a comprehensive understanding, theoretical framework, and previous experiences of the Artificial Intelligence use in the banking industry both in conventional and Islamic systems around the world, after shedding the lights on the current statistics of Islamic banking market and the artificial intelligence share in the

performance of banks, and delving into the history of Islamic banks generally and Moroccan Islamic banks specifically. Furthermore, the literature review will focus on the challenges and prospects of the artificial intelligence used in several Islamic and conventional banks in the world before zooming the experience to the Moroccan case and cite the major challenges that hinders the integration of AI in Morocco, which will be assisted by the confirmation of professionals through the interviews.

3.6 Data Analysis:

For this qualitative research, the semi-structured interviews are analyzed using an inductive approach distinctly the thematic data analysis. The data has been transformed from vocal information recorded during the interviews, to written information transcribed after the interviews.

Thematic analysis is defined as an approach used to discover, interpret, and document patterns (themes) within datasets (Braun & Clarke, 2006). Thematic analysis serves as a valuable method for scholars to define and describe the subjective reality of participants, utilizing their own written or spoken narratives. This approach effectively summarizes the reported insights of participants, thereby consolidating these perceptions into recognizable model. As an explanatory tool, thematic analysis enables the interpretation of meaning pertaining to experiences, stances, or belief systems, all viewed through the lens of a specific conceptual or theoretical framework. (Lochmiller, 2021).

Braun & Clarke (2006) propose a step-by-step approach to thematic analysis. The first step involves familiarizing oneself with the data by transcribing verbal information from interviews and identifying key ideas to establish the initial dataset for analysis. The subsequent step involves a systematic coding of intriguing features of the data across the entire dataset, with relevant data collected for each code. In the third stage, the process involves the arrangement of codes into prospective themes and the collection of all relevant data linked to each potential topic. The themes are then examined in parallel with their corresponding coded extracts and the entirety of the dataset. The fifth step requires clearly defining and naming the themes to be included in the analysis, while the final step involves producing a report or description for each theme.

3.7 Chapter Summary:

The study was conducted using a qualitative methodology, which involved integrating a comprehensive literature review and semi-structured interviews to gather data on the implementation of AI in Islamic banks in Morocco and its related challenges and prospects. Afterwards, the findings were discussed using a thematic analysis approach.



CHAPTER IV

RESULTS AND DISCUSSION

This chapter delves into an analysis of findings derived from semi-structured interviews carried out with various Moroccan experts in the field of technology and Islamic banking and finance. The purpose of these interviews was to assess the current state of the Fintech and AI adoption in Moroccan Islamic banks, the challenges faced, and the potential prospects and strategies for the future integration of AI technologies in the sector. By utilizing a semi-structured interview format, the study enabled in-depth discussions guided by pre-determined questions that were in line with the research objectives. This approach allowed for the collection of valuable qualitative data, offering a comprehensive understanding of the interviewees' perspectives on AI in Moroccan Islamic banks.

Through the application of thematic analysis, three main themes are identified for the discussion:

- The current landscape of AI and Fintech in Moroccan Islamic banks.
- The challenges encountered.
- The prospects and strategies for integrating AI in Moroccan Islamic banks.

The first theme is divided into two sub-themes:

- Current existence of AI and Fintech in Moroccan Islamic banks.
- The AI's advantages for the Moroccan Islamic banks.

The second theme is segmented into four distinct challenges:

- Regulatory and legal obstacles
- Investment related challenge
- Technological and infrastructural impediments
- The human effect.

Lastly the third theme which comprises three sub-parts displayed as follow:

- Strategies for an efficient AI implementation in Moroccan Islamic banks.

- Prospects awaited from this step.
- Experts' recommendations and suggestions.

The details of the interviews' questions with their related sub-themes and theme are displayed in the following table:

Table 4.1: Interview Themes and Questions.

| Main Themes | Sub-themes | Interview Questions |
|---|--|---|
| To examine the state of art of the technology adoption in Moroccan Participative Banks; | Current existence of AI and Fintech in Moroccan Islamic banks. | To what extent have Moroccan Islamic banks embraced Fintech and Artificial Intelligence? |
| | | What AI-based tools are utilized by Moroccan Islamic banks, and in which areas? |
| | Experts' opinion about the AI's advantages for the Moroccan Islamic banks. | Do you believe that Moroccan Islamic banks should adopt AI, and why? |
| | | How would the adoption of AI enable Islamic banks in Morocco to: <ul style="list-style-type: none"> • lower operational costs, • enhance security, • achieve faster payments, • provide superior transactions, • optimize banking inclusion, • and improve efficiency and transparency in their operations? |
| To investigate the challenges faced by Moroccan Islamic banking in adopting AI. | Regulatory and legal obstacles | To what extent do you believe that regulatory and legal impediments pose obstacles to the adoption of AI by Islamic banks in Morocco? |
| | Investment related challenge | To what degree do you think that the current level of investment in technology is inadequate for the widespread adoption of AI by Islamic banks in Morocco? |
| | Technological and infrastructural impediments | To what extent do technological and infrastructure considerations impact the readiness of Islamic banks to adopt AI? |

| | | |
|--|---|--|
| | The human effect. | To what degree is the availability of human resources, and customer awareness considered a challenge for the adoption of AI by Islamic banks? |
| To examine the prospects and future strategies for enhancing AI adoption in Moroccan Islamic Banking | Strategies for an efficient AI implementation in Moroccan Islamic banks | Which areas need improvement for Moroccan Islamic banks to be fully prepared for the adoption of Artificial Intelligence? and what factors facilitate this integration (investment, human resources, infrastructure, technology, governing laws, governance, and the awareness of the Islamic banks' clients, etc...)? |
| | | What strategies should Islamic banks adopt to overcome the current challenges in adopting AI? |
| | Prospects awaited from this step. | What are the prospects of the adoption of AI by Moroccan Islamic banks? |
| | Experts' recommendations and suggestions. | What additional suggestions and recommendations would you provide to Moroccan Islamic banks to fully embrace AI and improve their customer services, transactions, efficiency, and transparency in their operations? |

The interviews were carried out through online voice recorded video calls and voice calls using the platforms Zoom and WhatsApp. The languages utilized during the exchanges included English, French, and Arabic. Subsequently, the audio recordings were transcribed and translated into English texts. These texts were then compiled into a single table, along with the corresponding questions and their respective themes. This compilation aimed to streamline the analysis process and enable easy access to the answers provided by each expert.

This chapter outlines the background details of the experts who were interviewed, focusing on their organizational affiliations and roles within these institutions. The subsequent analysis of the findings will commence by examining the current utilization of AI and Fintech in Moroccan Islamic banks. This will be followed by an exploration of the challenges that are impeding the integration of AI within the Islamic

banking system in Morocco, strategies to overcome these obstacles and the expected outcomes of this integration will be discussed. Lastly, the chapter concludes with a summary and discussion.

4.1 Profile of the Experts:

As stated in the methodology part, the interviews were conducted with ten experts in the field of Islamic finance and the field of Fintech and Artificial intelligence. Five of them were managers in Islamic banks, and one in a conventional bank with expertise in Fintech and Islamic finance. Three of the interviewees are CEO or former CEO of Islamic finance consulting groups, and the remaining expert is a fintech consultant and Professor of Islamic economics and finance.

The interviewees details are projected as follows; (The names are codified).

Table 4.2: Interviewees' Information

| Interviewee | Title | Institution |
|--------------------|---|--|
| I.1 | Manager of strategy and organization department | Al Akhdar Bank |
| I.2 | Branch manager | Bank Assafa |
| I.3 | Green finance lead | MindED Inc. / Former CEO of El Maali Group |
| I.4 | CEO | Integration consulting |
| I.5 | Assistant professor and Fintech Consultant | Ibn Zohr University |
| I.6 | Founder and CEO | Fineopolis consulting |
| I.7 | Responsible digital | Bank Assafa |
| I.8 | Project Manager | Bank Assafa |
| I.9 | Manager of engagement studies | Bank Al yousr |
| I.10 | Head of Risk Management & Control | BCP Banque Populaire du Maroc. |

The interpretation of the results involves quotes from the participants. Each respondent's quotation is labelled with a number (I1 to I10) to enable easy reference to his profile and make it more practical when referring to his answer.

4.2 Current State of AI Adoption in Moroccan Islamic Banks:

4.2.1 Current Existence of AI and Fintech in Moroccan Islamic Banks

The experts who were interviewed were questioned regarding the current utilization of Fintech solutions and AI technologies in the Islamic banks of Morocco. All of the respondents agreed that there is currently no utilization of AI in the discussed organizations. The majority of them emphasized that, at this moment, the banks do not prioritize this technology. This is primarily because these banks have recently entered the market, with a history of merely seven years, and their main focus is on enhancing their products and services.

“The majority of Islamic banks in Morocco commenced their operations in early 2018. These new banks have spent their initial years establishing basic services and products and ensuring compliance with banking regulations. Artificial intelligence was not a priority for most of them.” (I1)

Consequently, none of the Moroccan Islamic banks employ any AI tools in their activities. However, one of the interviewees did mention the use of ChatGPT and Canva among the employees themselves, although it is not an officially endorsed practice by the institution. These tools serve as AI assistants for communication purposes, as quoted below:

“Morocco is not very developed in terms of Fintech, for example the (Mobile payment experience) has not realized the expected success in Moroccan banks. Crowdfunding platform is also totally new in the market, obviously based on Fintech, in 2023 we have just finished the legal arsenal concerning this platform so if we base ourselves on these two elements it is enough to say that overall, the Fintech level is partially low in Morocco. On the AI side, same observation, it is not used at the product level, but rather to improve communication (used ChatGPT to improve recruitment texts for example and Canva for image generation) But we are

considering the use of chat bots but not for the moment. Even in conventional banks, the use of AI is very modest and limited.” (I7)

For the Fintech part, I7 and all the respondents confirmed that there is an actual adoption of this technology by the Moroccan Islamic banks to achieve several services such as fraud detection and mobile banking for the customer services.

“If we talk Fintech, we can find mobile applications or mobile banking operators but nothing else, no AI based tools in the participative banks in Morocco.” (I6)

“For the fraud part, there are 'use cases' to capture information and detect fraud, based on Python and supervised and unsupervised Machine Learning next to logistic regression models for clustering and classification/stratification.” (I10)

Based on the above findings and upon examining various papers related to the Moroccan sector, it becomes evident that there is a notable absence of any sign regarding the incorporation of AI in Islamic banks in Morocco. This fact makes the research more significant in terms of answering the question of “why?” that incorporates the challenges that hindered this adoption, and “why?” that expresses the need for this implementation and the results awaited in the future.

4.2.2 Experts’ opinion about the AI’s advantages for the Moroccan Islamic banks:

The overwhelming majority of interviewees, nine out of ten, stressed the importance of incorporating AI into Islamic banks in Morocco as a crucial step towards a bright future and advantageous achievements in the national and international banking market. They highlighted several major benefits of this integration, including improved time management and accuracy, cost minimization, enhanced communication, and practical fraud detection capabilities. The question asked to the interviewees is whether they believe that the Moroccan Islamic banks should use the AI technology and why, and here are some of the answers:

“We definitely need to stabilize in the market first, reaching the break-even point is the first objective, investing in something else is secondary. However, if the conventional banks adopt the AI to some extent and we learned that they realize profit and are already

stable with it, then we can see the participative banks coming into this space Insha'Allah maybe after three years. In other words if I was a CEO of a bank, AI is something interesting, we have to look at it from risk and client acquisition perspective, and other things but the problem is now we have to realize the stability of the banks in the market first and then we can move forward to other challenges, improve user experience, improve credit scoring and other things we can use with AI.” (I6)

“Yes, in fact by using AI we save time and resources, we can also optimize costs, capture a maximum of information, control market trends, increase the performance of the marketing department and customer relations plus fraud detection, the regulatory part and customer complaints. In the same way, it will be possible to detect areas of niches and risks which are imperceptible by standard methods.” (I10)

The above statements align with the opinion of the researchers mentioned in the literature review, such as Aziz & Dowling (2018) who said that the financial industry could potentially save one trillion dollars by 2030 through the proper utilization of Artificial Intelligence. The influence of AI on Islamic finance and economic operations is deemed significant, with tools such as Chatbots, smart contracts, and other AI-based technologies being identified as potential catalysts for revolutionizing Islamic banking. Also Dr. Navleen Kaur et al. (2020) who identified several reasons to put AI into the banking activities. They mentioned for example, improving workers' productivity, optimizing productivity and efficiency, mitigating the risk of frauds and scams, processing vast amounts of data in record time and assisting efficient decision taking, etc...

In contrast, one of the interviewees contradicted the notion that AI is indispensable in Moroccan Islamic banks. Justifying their stance, they emphasized the significance of emotional intelligence within the domain of Islamic finance. The interviewee contended that customers are more inclined to trust a knowledgeable practitioner rather than a robot when it comes to making decisions related to Islamic options and regulations. He said the following:

“No, because emotional intelligence is very important in the field of participative banks, specifically in Sharia-related objects. Moroccan customers are not always ready to be more convinced by a robot than by a human professional.” (I9)

For this respondent, the Moroccan consumer's reliance on personal interactions in banking transactions may pose a barrier to embracing new technological advancements in the industry. This emphasizes the role of emotional intelligence in understanding and addressing customer preferences. Nevertheless, the case study of the bank of Tokyo, as discussed in Marinova et al. (2017) research, challenges this notion. The study reveals that this particular bank utilizes a humanoid robot named Nao, which operates within the 24-hour banking concept. Unlike humans, the robot is not limited by working hours and possesses the capability to process multilingual options. Additionally, the robot is equipped with the ability to interpret customer emotions based on their vocal tone and facial expressions.

In the same context, all the participants acknowledged the practicality of AI in terms of lowering operational costs, enhancing the security, achieving faster payments, providing superior transactions, optimizing banking inclusion, and improving efficiency and transparency in their operations. A greater part of the experts directed their attention towards the merits of integrating a Chatbot in every Islamic bank in Morocco. They underscored its ability to centralize information for enhanced transparency and comprehension, perform multiple tasks simultaneously within a limited timeframe, economize salary expenses, and diminish the occurrence of errors in transactions or banking services. Some of their answers are:

“It enables cost reduction, for example, if we onboard clients remotely and authenticate them through facial recognition, it necessarily reduces costs. Enhancing security, including fraud detection, is also possible. Accelerating payment and offering superior quality transactions is another advantage. Optimizing banking inclusion is achievable by developing banking products with reduced prices. Improving efficiency and transparency is also a benefit. Therefore, all these aspects can be enhanced using AI, and it also allows for the development of new projects.” (I3)

“Artificial intelligence has the potential to facilitate the establishment of participative banks in Morocco, leading to a reduction in costs. For instance, in the context of customer service, instead of relying solely on human employees, the implementation of AI technology would eliminate the need to pay the same level of wages, as a certain number of employees could be replaced by robots. Moreover, AI can significantly enhance security measures, particularly in the case of Islamic banks, where cybersecurity is of utmost importance for system protection. By acting as a cybersecurity agent, AI can effectively contribute to safeguarding the banks' operations. Additionally, AI can expedite transactions, particularly in terms of fund transfers between clients and banks, thereby streamlining the overall banking process.” (I5)

- *“Reduce operational costs; Instead of a call center containing several resources that costs the participative banks, we can put a chat bot that will operate the tasks assigned to it, reducing the number of staff, and the duration of the operation in a short period of time.*
- *Enhance security: Set up AI programs to monitor and enhance the security of banking transactions. Also, the creditworthiness of the customer through a scoring system containing the necessary information of the customer.*
- *Speed up payments: AI can be useful in verification for this point, in case you have bulk transfers and large amounts, you can set up an AI-based bot that it checks several aspects at once faster.*
- *Deliver high-quality transactions: Predict the customer's needs and design the most suitable products and services (through data and history related to the customer).*
- *Optimizing banking inclusion: rather through Fintech but not with AI.*
- *Improve the efficiency and transparency of banking operations: Make available to customers all the important*

and necessary information related to these operations through a chat bot that can guide them in each banking transaction. Efficiency can also be improved by AI with the quality of processing of banking products and services.”
(I7)

The data presented in the table below showcases the stance of each participant regarding the advantages of AI innovation in Islamic banks in Morocco, denoted by either agreement (A) or disagreement (D). It is important to note that not all interviewees provided input on every benefit discussed, referred to as (N/A).

Table 4.3: Participants’ Opinion on The Suggested Benefits of AI

| AI benefits and experts’ opinion | I1 | I2 | I3 | I4 | I5 | I6 | I7 | I8 | I9 | I10 | Total |
|---|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|--------------|
| Lower operational costs | A | A | A | A | A | A | A | N/A | A | A | 9/10 |
| Enhance security | A | A | A | N/A | A | N/A | A | N/A | A | A | 7/10 |
| Achieve faster payments | N/A | A | A | N/A | A | N/A | A | N/A | A | A | 6/10 |
| Provide superior transactions | N/A | A | A | N/A | N/A | N/A | A | N/A | A | A | 5/10 |
| Optimize banking inclusion | A | A | A | A | N/A | A | D | A | A | A | 8/10 |

| | | | | | | | | | | | |
|---|---|---|---|---|-----|---|---|-----|---|---|------|
| Improve efficiency and transparency in their operations | A | A | A | A | N/A | A | A | N/A | A | A | 8/10 |
|---|---|---|---|---|-----|---|---|-----|---|---|------|

The findings indicate that nine out of ten interviewees confirmed that AI has the potential to reduce operational costs while only five out of ten acknowledged that AI provide superior transactions. Only (I7) suggested as quoted above, that optimizing the banking inclusion is related to Fintech and not directly to the AI, and that was the only disagreement in the given answers.

4.3 Challenges Hindering AI Integration

4.3.1 Regulatory and legal obstacles

For the regulatory and legal impediments, respondents answered in three different ways:

The first category of the interviewees highlighted the lack of explicit regulations governing the implementation of AI in Moroccan Islamic banks, which is a notable challenge by itself. Some of this group of respondents underscored the importance of developing a legal framework to support the effective utilization of AI by actors within these institutions.

“Firstly, there must be a need to create a law that can manage this kind of technology, but only if this technology is being implemented. Otherwise, we cannot regulate an activity that is not even being practiced in the country. Therefore, it is necessary to consider the laws that are already in place to regulate technological activities, and also learn from the experiences of leading countries in integrating AI, in order to assess the development of appropriate laws and regulations.” (I4)

“There should be a regulation that frames the AI, because if not, it would have a negative impact, especially on banks in general and

therefore Islamic banks in Morocco. So, it is recommended to establish laws regarding AI to enable the Islamic banks a safe adoption and using but only in certain surfaces not all the surfaces, basically just to ensure a stabilization in the market.” (I5)

The respondent I5 had the same point of view as (Firmansyah & Anwar, 2019) who stated that Islamic Fintech firms encounter various obstacles, with regulatory challenges being among the most pressing. He suggested that to facilitate the advancement of this sector, policymakers must create a regulatory environment that supports its growth. Moreover, Ouidani & Oulcaid (2023) mentioned that this technology brings forth legal challenges related to the absence of a proper legal framework in Morocco and the safeguarding of customers' personal data.

The second category of the interviewees includes only one different answer of the expert (I2) who confirmed that the regulatory and legal impediments pose a challenge to the adoption of AI in Moroccan Islamic banks.

“Regulatory and legal barriers can pose significant obstacles to the adoption of AI by Islamic banks in Morocco. These obstacles may arise from inadequate regulations, lack of clarity in guidelines, or restrictions that do not consider the unique aspects of AI in the Islamic financial context. Overcoming these challenges requires careful evaluation and adaptation of the regulatory framework to promote innovation while ensuring compliance with Islamic finance principles. Let's work together to overcome these hurdles and embrace the potential of AI in Islamic banking.” (I2)

The interviewees in the last category, constituting the majority of responses, are in agreement that the adoption of AI within the discussed organizations is not impeded by legal restrictions and regulations. They also pointed out the fact that there are no specific laws that frame the use of AI in Moroccan banking sector, however, the personal data protection is regulated by the Moroccan (Commission Nationale de Contrôle de Protection de Données à Caractère Personnel, CNDP) which is a national commission for monitoring the protection of personal data. Some examples of the answers are as follows:

“In fact, no hindrance because AI can be implemented directly without the use of any law, and there are no specific regulations concerning AI, but we do have the regulations of the CNDP for the protection of consumer data, there the problem can arise in such a way that the CNDP can prohibit the use of AI abroad. For example, the CNDP can block activities based on foreign AI platforms at the international level for the risk of data leakage, because the law is applicable mainly to data.” (I7)

“Actually, it’s about customer data, with the CNDP, where we find the obligation of taking customer data protection in consideration when implementing AI. In the other hand, as most of the AI tools are cloud-based solutions, and that is very challenging in terms of adopting cloud solutions. Law 09-08 in the CNDP concerns the protection of personal data is the present regulatory framework that we have in Morocco when it is about the automatization of Data. However, there is no blockage because of any law decision or regulatory framework that would impede the adoption of AI.” (I8)

Based on the aforementioned results, more than the half of the respondents (60%) are in agreement that regulatory and legal factors do not impede the incorporation of artificial intelligence within Moroccan Islamic banks. This particular insight may be viewed as a beneficial factor for the advancement of AI technology within the banking industry of Morocco.

4.3.2 Investment Related Challenge

All participants agree that investment represents a major hurdle for Islamic banks in Morocco seeking to integrate AI technology. The majority of respondents highlighted the substantial financial commitment required for technology, noting that Islamic banks in Morocco have already invested heavily in their IT departments. Consequently, allocating further funds for AI implementation would prove to be a significant challenge.

“The implementation of AI-based systems requires a significant effort and substantial budgets, which restricts the adoption of AI.”

(11)

“The current investment in AI in Morocco is not sufficient. AI requires a huge amount of investment to be utilized, as it requires advanced systems and expertise such as the AI programs which are very less in the country.” **(15)**

“The participative banks in Morocco invested more than enough for the technology and it costs more than the other charges of the bank, especially for their core banking system and online banking etc.... and it’s always on progress since the starting of Moroccan Islamic banks, so, the investment is always there. Yet, in AI, it is not done yet. It is clearly more important to invest on basic and mandatory details that would help the progression of the bank rather than investing in AI which could come afterwards as an enhancer.” **(18)**

“The investment depends on the strategy of the banks who can decide whether to prioritize this technology or not. Participative banks always suffer from budget constraints so there is not really an orientation towards investment in AI technology.” **(110)**

The findings presented above highlight a notable observation regarding the insufficient investment in AI technology by Moroccan Islamic banks. This assertion is reinforced by the perspective of Ait et al. (2020), who emphasized the relatively low level of investment in AI technology by Morocco compared to other countries in the Middle East and Africa. This comparison is based on statistical data derived from a study conducted by Microsoft in 2019.

Moreover, there was unanimous agreement among these experts that the installation of this technology poses a significant challenge for these institutions. One of the reasons, is that these banks are allocating their budgets on internal structures, agencies, products, and information systems etc... These aspects take precedence over investing in artificial intelligence, as the primary objective is to fortify their market standing and transition from a deficit to a surplus in terms of profits and returns.

4.3.3 Technological and Infrastructural Impediments

The query regarding the implications of technological and infrastructural factors on the integration of AI in Moroccan Islamic banks was interpreted in two distinct manners. One group of respondents addressed both technological and infrastructural impediments, while the other group merged these two concepts and shared their opinion on the technological infrastructure and its influence on the adoption of AI. Nevertheless, both the groups agreed that the mentioned factor or two factors constitute an impediment to the AI integration in the Islamic banks in Morocco, some of them said that:

“In my opinion, the infrastructure of participative banks remains inadequate. Addressing the needs, it is crucial to prioritize increasing the number of branches, followed by other significant aspects such as expanding their network, enhancing efforts towards Fintech development, internal information system, training, advertising. Only then we can consider a specialized infrastructure for AI.” (I4)

“The significance of enhancing the tangible infrastructure of banks takes precedence over the level of technological infrastructure, particularly in light of the absence of participative bank branches in small towns. Moreover, the human touch remains a crucial factor for Moroccan customers, influencing their preference for in-person service at a branch over interaction with automated systems.” (I9)

“Participative banks in Morocco invested in the information system initially after they started in 2017. Unfortunately, this initial investment was dedicated to a practical and not dynamic system, which does not allow the development of this technology or switch to the use of AI, for that it is difficult to redo the entire information system for such innovations.” (I10)

The findings demonstrate that these viewpoints and more are in line with the perspective of Rahman et al. (2021), who derived from their investigations that the

main hurdles hindering the successful implementation of artificial intelligence encompass the scarcity of skilled professionals, along with adequate IT infrastructures, data security and privacy, and the absence of regulatory requirements.

As it is said in the literature part, Morocco is poised to experience a notable surge in the integration of artificial intelligence in different industries in the foreseeable future. Thus, it is essential to establish a solid foundation for the incorporation of this technology and play an active role in its progress within both the public and private domains.

4.3.4 Human Effect

The participants were asked about two key human-related factors that are anticipated to present major obstacles for the introduction of AI in Moroccan Islamic banks, namely the employees and clients of these establishments, with a primary focus on the sufficiency of their technological literacy levels. The objective was to determine whether the experts think that the Moroccan actors in the Islamic banking market possess sufficient knowledge and skills to engage adequately and smoothly with this innovation in their regular tasks.

All the respondents concurred the fact that there is a shortage of skilled human resources proficient in these innovative solutions, as well as the lack of consumer awareness about the topic. The following answers illustrate this idea:

“The availability of qualified human resources and customer awareness pose significant challenges for the adoption of AI by Islamic banks in Morocco. It is essential to train staff to master the required skills in the field of AI, and recruiting specialized professionals may be necessary. At the same time, raising awareness among customers about the benefits and security of AI-based technologies is crucial to establish trust and encourage their adoption. Overcoming these challenges requires continuous efforts in skill development and effective communication to create a smooth transition to AI in the Islamic banking sector.” (I2)

“The workforce allocated to participative banks is insufficient, and the current human resources are unqualified for such a

development, at least the majority of them. For these banks, the corporate clients are more important, although the significance of individual clients should not be undermined. While companies find the challenge manageable, the same cannot be said for individuals. There will always be a segment of clients who prefer traditional procedures.” (I4)

“In Morocco there are always customers who tend to the traditional way to carry out their service, we have a part who still does not trust the bank, another who trusts only one employee in the bank, which means that if he is absent the customer does not deposit his money, Another part that can't neglect the human smell, and that's part of the Moroccan culture, the human tact, the greetings with hand and face, the welcome and exchange with tea or coffee, etc... Of course, there is a good part that can adapt quickly with technology, but banks are still struggling with the first type of customer. For human resources, we can't define a certain number of professionals but if the employee is willing to learn and gain expertise in the new tools, he can do so and there are some who prefer to stay at the same level.” (I9)

The interviewees shared a similar idea, stating that the mindset of an important portion of Moroccan consumers is not prepared yet to adapt with the AI-based banking services. What's more, they pointed out that a major part of the human resources lacks the necessary training to effectively utilize this technology in the Islamic banks. Besides, they need to improve their skills in the Islamic financial domain, given the fact that this is a new market in Morocco, and several employees switched from the conventional system to what is known as the participative banking system in the Moroccan context.

The assertion made by experts is corroborated by Wilson et al. (2017) and Lynn et al. (2019), who concluded that the primary concern when introducing AI technology is the employees' ability to comprehend and effectively work with it. Besides, training a skilled workforce in this area is a process that requires a significant amount of time. This notion is consistent with the perspective of AL-Dosari et al. (2022), who

highlighted that training employees poses a significant challenge in the successful deployment of AI-driven systems.

4.4 Prospects and Strategies for Successful AI Integration

4.4.1. Strategies for an Efficient AI implementation in Moroccan Islamic Banks

To achieve this aim, the participants were required to address two specific questions. The first question was further divided into two components: the first component aimed to identify the specific areas requiring enhancement for Moroccan Islamic banks to be adequately equipped for the integration of Artificial Intelligence, while the second component focused on elucidating the factors that support this integration, including examples that would be validated or refuted by the interviewee at a later stage of their answer. The second question revolved around the viable strategies that these institutions should implement to overcome the challenges discussed and guarantee an effective integration of AI technology into their services.

Regarding the first question, a portion of the interviewees believe that the readiness of Islamic banking departments and the factors that could facilitate the integration of AI are not the primary focus. According to them, once AI is integrated, the entire process will smoothly progress and harmonize with the existing systems.

“The issue is not a concern as it is inevitable that it will happen one day, and all banks will be required to integrate it.” (I3)

“Once the AI is adopted, everything will be learned and developed through the process. In my opinion, it is not a real objective by itself, in Morocco, as different other actual objectives exist, such as stabilizing the banks in the market, broadening the client base either by having more products in the market and more branches, or by educating the clients about Islamic finance and the emerging tools used in it. Therefore, owning the technological resources, and increasing the client’s awareness is a must to achieve a great successful adoption of AI, additionally to the expertise required to deal with it.” (I6)

Another set of respondents, remarkably (I7), (I9), and (I10), agreed that all the factors proposed in the question are likely to improve the chances of a successful AI integration into the Islamic banking system in Morocco. Besides, (I7) and (I9)

highlighted the critical need to prioritize customer awareness, recognizing the gradual process involved in persuading Moroccan consumers to embrace innovative solutions over traditional ones.

“All the factors mentioned can improve the integration of AI, especially HR, except for the customers as we cannot change everyone's mindset because we will always have customers who will still not use bank cards or technology and will always resort to modern solutions such as going to bank branches to proceed with their banking activity.” (I7)

The remaining participants categorized the departments' readiness and the variables influencing this transformation in their own unique manner. Some individuals placed emphasis on human resources, while others believed that the regulatory framework should be the primary concern. Additionally, a few experts highlighted the significance of IT and information systems as the initial focus in the evolutionary journey. The subsequent table illustrates the varying degrees of importance assigned to these factors by the consulted specialists:

Table 4.4: Participants' classification of the importance of the proposed factor in integrating AI in Moroccan Islamic banks.

| AI benefits and experts' opinion | I1 | I2 | I3 | I4 | I5 | I6 | I7 | I8 | I9 | I10 | Average * | Ranking |
|----------------------------------|-----------------|-----------------|-----|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------|-----------------|
| Investment | n/a | n/a | n/a | 1 st | 2 nd | n/a | 2 nd | n/a | 2 nd | 1 st | 3,8 | 5 th |
| HR | 4 th | 2 nd | n/a | 1 st | 2 nd | 3 rd | 1 st | 3 rd | 2 nd | 1 st | 2,5 | 1 st |
| Infrastructure | 3 rd | 3 rd | n/a | 2 nd | n/a | n/a | 2 nd | 1 st | 2 nd | 1 st | 3,2 | 2 nd |

| | | | | | | | | | | | | |
|--------------------|------------------------------|-----------------|-----|-----------------|-----------------|------------------------------|------------------------------|------------------------------|------------------------------|-----------------|-----|-----------------|
| Technology | 5 th | 1 st | n/a | n/a | n/a | 1 st | 2 nd _d | 2 nd _d | 2 nd _d | 1 st | 3,2 | 2 nd |
| Regulations | 2 nd _d | 4 th | n/a | 3 rd | 1 st | n/a | 2 nd _d | n/a | 2 nd _d | 1 st | 3,3 | 3 rd |
| Customer awareness | 1 st | 5 th | n/a | n/a | n/a | 2 nd _d | 2 nd _d | n/a | 1 st | 1 st | 3,6 | 4 th |

*n/a is considered as the 6th place.

Based on the interviewed experts' insights, the primary concern for ensuring a successful AI integration in the Islamic banking system is the advancement of human resources expertise. This is followed by infrastructure and technology, which are ranked second, while the establishment and enhancement of regulations and laws are identified as the third key factor. Customer awareness is then underscored as an important element, with investment being placed last among the mentioned categories. However, several other factors should be taken under consideration when integrating AI in the Islamic banks in Morocco, some of them were cited in the answers of the interviewees such as the governance, and the level of cybersecurity, etc...

(Bachir & Marzouki, 2023) echo the experts' argument, underscoring the essential requirement for Morocco to promote the growth of human proficiency in this sector, specifically individuals with the ability to analyze and comprehend technological methods. They stated that Morocco is required to intensify its endeavors in enhancing the security measures and defense mechanisms of its information systems. They added that, it is crucial for Morocco to establish a legal and regulatory framework that addresses these concerns.

The second question holds the same implication, as the participants were prompted to discuss any viable strategies that could aid in the effortless integration of AI within

Islamic banks. The answers were mainly orientated toward the internal adjustment and enhancement of the banks' strategies concerning technology and innovation.

Below some of the proposed strategies:

“The adoption of AI will be facilitated by a digital transformation of banks, with a particular emphasis on automating banking processes.” (I1)

“In the face of challenges, banks should enhance their internal skills, collaborate with partners, establish clear governance, invest in R&D, and foster an innovative culture.” (I2)

“Develop a training plan for the employees, an annual training plan on different aspects, secondly, we should conduct an analysis gap between the current IT infrastructure situation, and the expected situation to embrace AI technology, and also define list and priorities of potential AI quick wins.” (I8)

Additionally, certain respondents highlighted the necessity for Islamic banks to solidify their market presence before venturing into secondary investments. On the other hand, alternative suggestions included implementing a test and learn strategy by leveraging the knowledge gained from other banks' utilization of AI technology.

4.4.2. Prospects awaited from this step.

The experts were posed with a question regarding the potential for integrating AI into the Islamic banks of Morocco. The viewpoints on this issue demonstrate a notable diversity, as displayed in the following quoted answers:

“The upcoming years will be crucial for the adoption of AI, as Banks will launch numerous projects in the field of AI, enabling the implementation of AI in key banking areas such as customer onboarding, loan approvals, anti-money laundering, and risk management.” (I1)

“Prospects are, costs optimization, advanced assistance in decision making, more competitiveness with AI solutions for the clients, enhance the security, the efficiency and transparency.” (I8)

“The prospects must be positive. Good IT application by banks is expected. Their brand image will be positively impacted by the application of artificial intelligence.” (I9)

The prospects outlined by the experts can be concisely summarized as follows:

- More AI projects for the optimization of banking inclusion, customer service, anti-money laundering, and risk management.
- Stimulate the growth of Fintech products and services.
- Better mitigation and control of risks linked to existing market participants.
- Easier money transfer.
- Improvement of services directly related to customers.
- Rising interest in Islamic banks in Morocco.
- Enhancing consumer banking experiences.
- Efficient cost management and streamlining expenses.
- Advanced decision-making support.
- Eager competition with AI solutions to meet client needs.
- Improving security, efficiency, and transparency.
- Development of IT services.
- Positive impact on the reputation of the Moroccan Islamic bank’s brand image through AI adoption.
- Simplified and practical digital banking solutions.
- Expanding the Moroccan Islamic banking market share internationally, including among SMEs and Moroccan legal entities operating outside the country.

4.4.3. Experts’ recommendations and suggestions.

The final question was reserved for further recommendations and suggestions that the interviewees could put forward to strengthen the case for implementing AI in Moroccan Islamic banks. They advise giving utmost importance to the integration of AI technology and commencing efforts to disseminate technological awareness and literacy among Moroccan consumers. This proactive approach aims to ensure their readiness for this imminent transformation. The experts suggested to create partnerships with fintech specialists to handle the groundwork for this upcoming

technology. The ideas deviated in several manners, as illustrated by the subsequent responses.

“Creating strategic partnerships with fintech organizations to accelerate the adoption of AI and focus its utilization on enhancing customer service.” (I1)

“Recommendations for AI integration involve continuous training initiatives, robust cybersecurity measures, sectoral cooperation, alignment of AI utilization with Islamic ethics, and transparent client communication to build trust.” (I2)

“Moroccan participative banks have a unique opportunity to leverage their youthful nature in order to further advance their technological capabilities. Unlike conventional banks, these institutions cannot maintain a vast number of branches, which presents an opening to develop digital banking and fintech. The integration of AI and fintech has become essential, and it is crucial for banks to incorporate these elements into their strategic outlook and development plans. This is not a matter of choice; it is a necessary course of action that must be pursued under all circumstances. The means must be provided, and the initiative must be undertaken. Therefore, Moroccan participative banks, being in their early stages, have an advantage over conventional banks burdened with historical backgrounds and infrastructure, allowing them to expedite the adoption of AI and fintech.” (I3)

“It is highly recommended for participative banks in Morocco to adopt AI in order to attract more capital by leveraging it in customer-related activities.” (I4)

“Focus on the awareness of both the clients and the employees.” (I6)

“First test and analyze the experience of other banks to learn what it takes before embarking on the project.” (I7)

The above findings encompassed the primary concepts put forth by the consulted experts. It is worth noting that all the recommendations held significance and

contributed to the preparation for the implementation of AI in Islamic banks in Morocco. Consequently, the majority of the suggested ideas revolved around the factors previously proposed to bolster this undertaking. They are listed as follows:

- Test and learn strategies.
- Invest in research and development.
- Developing strategic partnerships with fintech experts to quicken the adoption of AI and channel its use towards enhancing customer service.
- Ensure continuous trainings for the workforces to improve technological skills.
- Improve the cybersecurity and invest in systems that ensure the integrity, security, and privacy of customer and banking data.
- Establish clear governance and foster an innovative culture in the Moroccan environment.
- The Moroccan Islamic banks should capitalize on their early stage by concurrently implementing AI while expanding their presence in the market.
- Place importance on client awareness.
- Conduct a thorough examination and evaluation of the practices and outcomes of integrating AI in other Islamic banks in order to gain valuable insights and knowledge.
- Benefit from the experience of conventional banks in Morocco that have successfully adopted AI technology.
- Decision-makers in Moroccan Islamic banks should be open to technology and consider hiring specialists to improve services, avoiding sudden changes.
- Complete the existing legal and regulatory framework in Morocco as a prerequisite for complex policies and solid foundation.
- Establishing innovation labs and accelerators to support and guide Fintech companies that could help in the implementation of AI.
- Enhance regulators and stakeholders' expertise through capacity building in technology.

- An analysis should be conducted to assess the disparity between the existing IT infrastructure and the anticipated state required to effectively incorporate AI technology.
- Develop a catalogue of potential AI quick wins and prioritize them accordingly in the implementation process within the Moroccan Islamic banking system.
- Establish a *Shariah*-Compliant AI Committee.
- Improve the technological infrastructure by investing in high-speed connectivity, cloud storage, and advanced analytics tools.

4.5 Chapter summary and discussion:

This chapter presents a thorough analysis of the current state of AI adoption in Moroccan banks, followed by an examination of the challenges impeding this process, as well as the prospects expected from it.

The interviewees confirmed the fact that the AI is not yet utilized by the Islamic banks in Morocco. Instead, they have opted for the adoption of fintech innovations such as mobile banking and fraud detection to enhance their online services. This is mostly due to the relative novelty of Islamic banks in the market, prioritizing market stabilization over the utilization of AI, considering this technology in this particular period as a secondary detail and a backup tool rather than a necessity for their growth and steadiness. Still, there is unanimous consent on how important this innovation is for a smooth growth and better results.

The implementation of artificial intelligence (AI) in Morocco seems to face various obstacles. The absence of clear regulations regarding AI usage highlights the need for a legal structure to facilitate AI development while safeguarding data privacy. Financial hurdles pose a major challenge, as financial institutions tend to prioritize fundamental infrastructure and IT systems over AI investment due to limited budgets. Moreover, the sector suffers inadequate banking infrastructure and technological capabilities, emphasizing the enhancement of IT systems to support AI integration. Additionally, a shortage of skilled professionals and cultural preferences for personal interactions over automated services present substantial barriers. The most significant hurdle for these institutions is to move past their settling and stability phase and enhance their market presence. This will provide them with the flexibility to invest in

advanced technologies that can aid in their development and enhance their operational efficiency.

Overcoming these challenges require strategic partnerships with AI and Fintech experts for a sharing expertise. The country's government needs to provide a suitable regulatory framework and assisting technological programs to propagate the digital literacy maintaining a balance between technological advancements and the cultural preferences of Moroccan consumers. Also, refine the individuals' expertise, with the initiative of the Islamic banks to offer the needed formations for their employees. Actually, lot of investment is recommended to help administer the AI into the Islamic banks such as investing in cybersecurity systems, cloud storage, high speed connectivity and other advanced analytical tools. Yet, the financial resources needed for this initiative exceed the capacity of the banks involved. It is advisable then to adopt a systematic implementation approach, incorporating a test and learn strategy, and leveraging the expertise of conventional and international Islamic banks in utilizing AI technology.

The prospects for AI integration in Moroccan Islamic banks are promising, with anticipated benefits including enhanced operational efficiency, improved customer experiences, advanced fraud detection, and increased financial inclusion. AI is expected to streamline banking processes, reduce operational costs, and improve decision-making capabilities. Technologies like chatbots can provide personalized customer interactions and faster response times, contributing to a more competitive stance in both national and international markets. The advantages of AI technology are widely acknowledged and deemed valuable enough to warrant integration into any organization and service. However, it is crucial to recognize the potential threats associated with this technology, particularly in terms of the risks posed by the accessibility to personal data and involvement in strategic decision-making processes. Therefore, Moroccan Islamic banks must exercise caution and carefully consider the implications of introducing such innovations into their systems, particularly in terms of ensuring compliance with *Shariah* law and addressing ethical concerns.

CHAPTER V

CONCLUSION

Within this chapter, the discussion will be structured around five key sections: The first section presents the conclusion of the thesis, the second section outlines the implications of the study, the third section projects an analysis of the strategies and recommendations derived from the study, and finally, suggestions for future research studies are listed in the last section.

5.1 Conclusion

The digital revolution has brought about significant advancements in the operations of Islamic banks worldwide, enabling them to achieve commendable progress. Consequently, the Islamic financial and economic services have attained significant prominence, thereby expanding their market shares on a global scale. Nevertheless, Moroccan Islamic banks have yet to embrace the utilization of Artificial Intelligence in their operations, lagging behind their counterparts in this regard. Therefore, this research holds significant importance in establishing a connection between the two realms within the continuous efforts of Moroccan Islamic banks. This is especially critical considering the lag exhibited by these banks in adapting to the technological advancements of the modern era.

In Morocco, the idea of integrating AI in the Islamic banks is nascent. Hence, there is a deficiency of academic papers addressing the possible opportunities and challenges linked to the deployment of artificial intelligence in Moroccan Islamic banks. This study seeks to address this gap and offer valuable insights through investigating the reasons behind the hindrance of the adoption of AI in the Moroccan Islamic banks, and the awaited prospects of this venture.

The thesis investigates various facets pertaining to the correlation between AI and Islamic banking, with a specific emphasis on the Moroccan sector. It delves into the overall adoption of AI within the banking sector, subsequently analysing its association with Islamic banks. Additionally, it underscores the significance of AI in

Moroccan Islamic banks and addresses the obstacles encountered during the integration of AI into their systems.

The study was conducted using a qualitative methodology, which involved integrating a comprehensive literature review and semi-structured interviews to gather data on the implementation of AI in Islamic banks in Morocco and its related challenges and prospects. Afterwards, the findings were discussed using a thematic analysis approach.

The findings section presents a thorough analysis of the current state of AI adoption in Moroccan banks, followed by an examination of the challenges impeding this process, as well as the prospects expected from it.

The results indicate that Moroccan Islamic banks do not currently utilize artificial intelligence in their operations. Nevertheless, certain financial technology tools are utilized to provide various services, including fraud detection and mobile banking for customer service purposes, etc... In the same context, the practicality of artificial intelligence (AI) was recognized by all the interviewees for its ability to reduce operational costs, boost security measures, expedite payment processes, offer better transaction experiences, promote financial inclusion, and enhance operational efficiency and transparency. A majority of those experts focused on the advantages of incorporating a Chatbot in each Islamic bank in Morocco. They highlighted its capacity to consolidate information for improved transparency and understanding, handle multiple tasks concurrently within a set timeframe, save on salary expenditures, and reduce errors in transactions and banking services.

The challenges related to the implementation of AI in the Islamic banks in Morocco may be linked to legal and regulatory aspects, investment impediments, technological and infrastructural factors in the country, the potential of human resources, and the perspectives of Moroccan consumers regarding the utilities of AI, among others.

- **Regulatory and legal obstacles:** Regarding the regulatory and legal dimension, six out of ten interviewees reached a consensus that this factor does not constitute a typical impediment for the implementation of AI. However, they did highlight its potential to restrict the utilization of this technology once it has been deployed.
- **Investment:** Integrating a large-scale technology into their systems poses a significant challenge for Islamic banks in Morocco due to limited investment resources. With only 7 years of market presence, these institutions struggle to

allocate adequate budgets for technological advancements in order to stabilize their operations and reap the benefits of their products and services. Consequently, Moroccan Islamic banks are hesitant to invest heavily in technology and innovation initiatives.

- **Technology and infrastructure:** The Moroccan Islamic banks currently lack the necessary technology and infrastructure to support the proposed transformation, which poses an additional obstacle to the discussed endeavor.
- **Human resources expertise:** Within the Islamic banking sector in Morocco, there exists a notable scarcity of adequately trained professionals who can proficiently operate advanced tools like artificial intelligence. The majority of employees in this field lack the necessary training to effectively integrate AI into their regular tasks.
- **Customer awareness:** Many Moroccan consumers continue to favor traditional service approaches over technological solutions, as they are accustomed to the personalized interactions and cultural norms embedded in Moroccan service traditions. This reluctance stems from their familiarity with the human tact and cultural customs associated with traditional Moroccan service practices, despite being knowledgeable about innovative solutions.
- **Other obstacles:** The interviewees highlighted several additional challenges, including the need for greater transparency and clarity in information, particularly when it pertains to *Shariah* principles. Furthermore, they emphasized the importance of addressing cybersecurity concerns and ensuring a high level of protection.

The prospects gathered from the interviewed experts' answers can be succinctly expressed as follows: more AI projects are anticipated to optimize banking inclusion, customer service, anti-money laundering, and risk management. This will stimulate the growth of Fintech products and services, better mitigate and control risks associated with existing market participants and facilitate easier money transfers. Additionally, these technologies will improve customer-related services and drive rising interest in Islamic banks in Morocco, enhancing consumer banking experiences and efficiently managing costs.

Moreover, AI adoption is expected to provide advanced decision-making support, foster eager competition to meet client needs, and improve security, efficiency, and transparency. The development of IT services will also be prioritized, positively impacting the brand image of Moroccan Islamic banks. Simplified and practical digital banking solutions will further expand the market share of Moroccan Islamic banking internationally, including among SMEs and Moroccan legal entities operating abroad. Indeed, the integration of AI technology in leading Islamic banks like KFH, DIB, and others occurred following years of establishment and expertise in the industry. In contrast, the Moroccan Islamic banks, which are only 7 years old, cannot be totally ready to engage in such an endeavor while trying to ensure a solid stabilization and confident growth. Besides, they entered the market alongside well-established conventional banks that are also leveraging AI advancements. Despite this, the new Moroccan banks can benefit from the experiences of these larger institutions and prevent costly errors. In addition, a series of recommendations have been put forward to facilitate the integration of AI technology into the Islamic banking sector in Morocco. However, the practicality and execution of these recommendations appear to be posing further challenges in light of the current situation of these institutions in both the Moroccan and global markets. Moreover, the professionals involved in the incorporation of AI in Moroccan Islamic banks must not only consider the promising opportunities that this remarkable initiative may bring, but also need to be mindful of the potential risks associated with it and take proactive measures to address and minimize any form of risk.

5.2 Implication of the Study:

Moroccan Islamic banks can improve their adoption of AI by carefully analyzing the challenges discussed and considering the potential prospects mentioned. It is essential for these banks to align their investment strategies with the needs of AI implementation in order to enhance customer satisfaction and operational efficiencies. Additionally, upgrading the existing infrastructure and providing training to staff members are crucial steps for successfully integrating this innovation. Moreover, establishing partnerships with fintech professionals and firms would enable these banks to gain valuable knowledge and accelerate the adoption of AI. Lastly, it is important for Moroccan Islamic banks to engage with regulatory bodies to shape the regulations

governing the use of AI, ensuring compliance with national and Islamic banking standards.

5.2.1. Implication for Islamic Banks in Morocco:

Moroccan Islamic banks can improve their adoption of AI by carefully analyzing the challenges discussed and considering the potential prospects mentioned. It is essential for these banks to align their investment strategies with the needs of AI implementation in order to enhance customer satisfaction and operational efficiencies. Additionally, upgrading the existing infrastructure and providing training to staff members are crucial steps for successfully integrating this innovation. Moreover, establishing partnerships with fintech professionals and firms would enable these banks to gain valuable knowledge and accelerate the adoption of AI. Lastly, it is important for Moroccan Islamic banks to engage with regulatory bodies to shape the regulations governing the use of AI, ensuring compliance with national and Islamic banking standards.

5.2.2. Implication for Policymakers in Morocco:

The policymakers of the country must ensure that regulatory frameworks are in sync with technological advancements like artificial intelligence. This entails providing clear guidelines that not only support innovation but also uphold financial stability and consumer protection. Furthermore, there should be a concerted effort to promote Research and Development to motivate experts in Banking, Fintech, and other relevant sectors to devise practical solutions and beneficial facilities. This will contribute to nurturing an innovative ecosystem that propels the banking industry forward.

5.2.3. Implication for Researchers:

This study addresses the deficiency in existing literature concerning the obstacles and potential benefits of integrating AI within Moroccan Islamic banks, and opens avenue for further research, particularly the topics suggested in the fourth section of this chapter. The intersection of technology, finance, and *Shariah* laws provides a promising platform for interdisciplinary studies that links fintech and innovations with Islamic Financial Institutions.

5.3 Strategies and Recommendations

The conclusions drawn from the interviews and research findings have led to the development of strategies and recommendations to address the challenges discussed and ensure a smooth and accurate integration of AI in Moroccan Islamic banks. These strategies include adopting test and learn approaches, investing in research and development, and forming strategic partnerships with fintech experts to accelerate AI adoption and enhance customer service. Continuous training for the workforce is essential to improve technological skills, alongside improving cybersecurity and investing in systems that ensure the integrity, security, and privacy of customer and banking data. Establishing clear governance and fostering an innovative culture within the Moroccan environment are also crucial steps.

Additionally, Moroccan Islamic banks should leverage their early stage by integrating AI while expanding their market presence. Enhancing client awareness, learning from other Islamic banks' AI integration practices, and benefiting from the experiences of conventional banks in Morocco that have successfully adopted AI are recommended. Decision-makers should remain open to technology, consider hiring specialists, and avoid sudden changes. Completing the existing legal and regulatory framework in Morocco is necessary for a solid foundation. Establishing innovation labs and accelerators to support fintech companies, enhancing regulators' and stakeholders' expertise through capacity building, and conducting analyses to assess IT infrastructure needs are critical. Developing a catalogue of potential AI quick wins, establishing a Shariah-Compliant AI Committee, and improving technological infrastructure through investments in high-speed connectivity, cloud storage, and advanced analytics tools are also recommended strategies.

5.4 Future Research

Further exploration into AI integration in Moroccan Islamic banks holds promise for future research. By delving into various dimensions, researchers can understand the impacts of AI and optimize its implementation. Potential areas for investigation are outlined below:

- Investigate how AI can be designed and implemented to ensure compliance with *Shariah* principles.

- Conduct comparative studies between the use of AI in conventional banks and Islamic banks.
- Study the impact of AI on the employment in Islamic banks.
- Study the role of AI in managing risk within the Islamic banks.
- Investigate the perceptions of banking consumers regarding AI-based services and contrast them with their perceptions of traditional methods in the least developed nations.
- Explore ethical AI frameworks within the realm of Islamic banks, that would promote transparency and accountability, adhering to ethical and Islamic standards.

The inclusion of these potential research dimensions can significantly enhance the strategic progress of AI in Islamic banking in Morocco and around the world. This enhancement encompasses academic insights and practical guidance that could aid both academics and professionals in the field to optimize their work and upgrade the industry.

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