

Artificial intelligence and Islamic finance: issues and challenges الذكاء الاصطناعي والصيرفة الإسلامية : الرهانات والتحديات

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Received: 2026-06-11

Accepted: 2026-06-19

Abstract:

Artificial intelligence (AI) is revolutionizing Islamic finance by automating Sharia compliance, improving risk management, and personalizing services, all while adhering to ethical principles such as the absence of riba (interest) or gharar (usury). In Algeria, as banking digitalization progresses, artificial intelligence is supporting ongoing transformations, even though its specific application in Islamic finance remains in its infancy. The purpose of this paper is to highlight the importance of AI in the real-time analysis of contracts and transactions through advanced algorithms to detect non-compliance and Sharia robo-advisors that automate ethical decision-making.

The results of this study confirm that despite the widespread adoption of artificial intelligence, particularly by Middle Eastern banks, several challenges remain, including data security, regulatory compliance, and a lack of AI skills and expertise

Keywords : AI, Islamic banks, Sharia, riba, gharar, bank performance...

Jel Classification Codes : G20, G21

ملخص :

يحدث الذكاء الاصطناعي ثورة في التمويل الإسلامي من خلال أتمتة الامتثال لأحكام الشريعة، وتحسين إدارة المخاطر، وتخصيص الخدمات، مع مراعاة المبادئ الأخلاقية كحرمة الربا والغرر. في الجزائر، ومع تقدم التحول الرقمي في القطاع المصرفي لا يزال استخدام الذكاء الاصطناعي محدودا في التمويل الإسلامي تهدف هذه الورقة إلى تسليط الضوء على أهمية الذكاء الاصطناعي في التحليل الفوري للعقود والمعاملات من خلال كشف المخالفات وفقا للشريعة الإسلامية.

تؤكد نتائج هذه الدراسة أنه على الرغم من الانتشار الواسع للذكاء الاصطناعي، لا سيما في بنوك الشرق الأوسط، لا تزال هناك تحديات عديدة، مثل أمن البيانات، والامتثال للمعايير التنظيمية، ونقص المهارات والخبرات في مجال الذكاء الاصطناعي.

كلمات مفتاحية: الذكاء الاصطناعي، البنوك الإسلامية، الشريعة، الربا، الغرر، أداء البنوك...

تصنيف JEL: G20, G21

1 INTRODUCTION

Artificial intelligence (AI) is revolutionizing Islamic finance by automating Sharia compliance, improving risk management, and personalizing services, all while adhering to ethical principles such as the absence of *riba* (usury) and *gharar* (usury) (Rapport de la Banque islamique de développement sur la transformation du système financier islamique, 2022).. In Algeria, as banking digitalization progresses (Bahri, O. E. K., 2012), AI is supporting ongoing transformations, even though its specific use in Islamic finance remains in its early stages.

In light of this situation, our research question was formulated as follows:

What are the stakes and challenges of artificial intelligence in islamic finance?

The secondary questions are structured as follows:

How does artificial intelligence contribute to monitoring Sharia compliance? How can artificial intelligence identify *riba*, *gharar*, and *maysir* (usury) in Islamic financial transactions?

What are the benefits and disadvantages of using artificial intelligence in islamic finance?

What are the specific characteristics of artificial intelligence in Islamic banking institutions in Algeria?

The subject of this publication is structured around these axes.

1- AI Applications in Islamic Finance

Several Islamic banks are already using artificial intelligence (AI) for practical applications such as Sharia monitoring, robo-advisors for halal compliance, and fraud detection, improving efficiency while remaining true to Islamic principles. These applications, being piloted in Asia and the Middle East, are promoting financial inclusion and personalized services.

1-1- Sharia Monitoring

Artificial intelligence uses natural language processing to automatically analyze transactions and contracts, enabling real-time detection of *riba* (usury), *gharar* (unlawful usury), or *maysir* (unlawful usury).

1-2-Automated Financial Advisors or Halal Robots

- Automated halal advisors such as Wahed Invest review stocks that do not comply with Sharia law (through the AAOIFI: Accounting and Audit Organization for Islamic Financial Institutions) and offer customized portfolios.
- Tools such as Zoya, IdealRatings, or Finispia continuously analyze investments in terms of compliance scores.
- NurAI (Malaysia, 2025) is a Sharia-compliant language model designed for halal finance and religious authorities.

1-3-Other Use Cases

- Fraud detection and sukuk/takaful optimization through predictive analytics.
- Zakat calculators (Islamic Relief UK) and Islamic will drafting (IFG Wills).
- AI-powered microfinance platforms for underbanked communities, leveraging transactional data instead of traditional credit scores.

2- How Artificial Intelligence Contributes to Sharia Compliance Monitoring

Through the automation of real-time analysis of financial transactions and contracts, artificial intelligence (AI) is transforming how Sharia compliance is monitored, identifying potential violations such as *riba*, *gharar*, or *maysir* with improved accuracy. This minimizes human error and optimizes procedures, while preserving the transparency required by Islamic principles (Dominique de courcelles, 2010).

2-1 Main Mechanisms

Artificial intelligence uses:

- Natural Language Processing (NLP) to analyze contracts and transactions, comparing them with AAOIFI (Islamic Accounting and Auditing Organizations) standards or fatwas stored in specific databases.
- Machine learning algorithms to detect abnormal patterns (e.g., hidden interests) and generate instant notifications for modifications.
- Integration of blockchain technology for unalterable traceability, consolidating regular audits carried out by Sharia councils.

2-2-Practical Examples

At Dubai Islamic Bank, artificial intelligence continuously reviews the compliance of sukuk and murabaha transactions, reducing processing times by 70%.

- Bahrain Islamic Bank is implementing artificial intelligence to manage 1,800 fatwas and filter transactions using chatbots.
- Research in Saudi Arabia indicates progress in transparency, despite challenges such as limited Sharia data sets.

2-3-Advantages and Limitations

Reduced audit costs (by approximately 50%) and risks of non-compliance; personalization of halal products through forecasting.

Limitations: biased data sets, lack of transparency, a "black box" approach requiring hybrid governance (AI + Sharia specialists).

3- Ethical and Legal Limitations of Artificial Intelligence in Islamic Finance

Artificial intelligence in Islamic finance raises significant ethical questions, such as algorithmic biases that contradict Sharia justice, as well as legal issues related to the lack of explicit fatwas and inadequate regulation. These challenges jeopardize transparency and fairness (Guellil Z et Bouri S,2024), the foundations of Islam, thus necessitating a hybrid governance model.

3-1- Ethical Restrictions

AI models trained on biased datasets (Western, non-Sharia) risk discriminating or making unfair decisions that contradict *adl* (justice) and *maslaha* (the common good).

The lack of transparency of these "black boxes" makes human verification impossible, introducing forbidden *gharar* (uncertainty); the confidentiality of sensitive data exposes it to ethical breaches.

3-2-Legal Restrictions

Among the legal restrictions, we note the following:

- Lack of specific legal regulations (Ameur Kamel . Cherfi Assia 2023).: global rules (e.g., the EU AI Act) do not take into account AAOIFI standards; fatwas on AI are infrequent (Majma' al-Fiqh is cautious).

- The lack of reliable datasets hinders compliance; cross-border challenges exist for international financial institutions without harmonized jurisprudence (Brack, E. (2007)).
- Undefined liability in the event of AI errors (who decides: the algorithm or the Sharia council?).

3-3-Suggested Solutions

- Ethical governance: Sharia councils monitor AI, regular audits are conducted, and local datasets are used (e.g., Saudi initiatives).
- Integration of Maqasid al-Shariah for ethical AI.

In Algeria, alignment with the BADR/ABE reforms is achieved through appropriate training and regulations.

4- Examples of AI Success Stories in Islamic Banking Institutions

In Saudi Arabia, Al Rajhi Bank uses artificial intelligence to automate compliance checks, ensuring its products adhere to Sharia standards. This includes the prohibition of Riba (usury) and Maysir (speculation), which are prohibited in Islamic finance. (Al Rajhi Bank of Saudi Arabia 2024 Assessment)

Furthermore, AI enables the tailoring of Islamic financial products to meet specific customer needs, using advanced behavioral analytics. The use of AI systems for automation also contributes to improved risk management, regulatory compliance, and Sharia-compliant investment decisions, while reducing human error and processing times.

5- Key elements of integrating artificial intelligence into the Islamic banking sector:

- Automated Sharia Compliance: AI-based algorithms are implemented to ensure that products and transactions adhere to Islamic standards, notably by prohibiting investments in forbidden areas (gambling, alcohol).
- Contract Management: Artificial intelligence contributes to the structuring and monitoring of partnership and commercial contracts (Mudaraba, Salam, Istisna, Ijar).
- Ethical Investment: Responsible management. Through data analysis, artificial intelligence can identify sustainable and ethical investment opportunities that go beyond mere compliance obligations.

- Digital Customer Experience: AI is implemented to optimize the customer experience in online Islamic banks, offering tailored services without incurring interest charges.
- Data automation: Thanks to AI, the implementation of intelligent databases makes it possible to assess the credibility of business partners, a crucial aspect for risk sharing.

The integration of artificial intelligence by Islamic banks, particularly in the Middle East, is of strategic importance for strengthening their competitiveness (ALGABID. H). while strictly adhering to the ethical principles of Islamic finance (GUERANGER. F.).

Artificial intelligence (AI) is radically transforming the banking sector in the Middle East (TRAUTE. W, 1983), particularly in the Gulf Cooperation Council (GCC) member states. At the forefront of the digital transition, financial institutions are using AI to optimize their operational efficiency and tailor the customer experience.

In the Middle East region, optimizing the customer experience is central to AI integration. Financial institutions are implementing AI-powered chatbots, digital assistants, and recommendation systems to enhance customer engagement. Emirates NBD was a pioneer with its virtual assistant, "Eva," capable of answering customer inquiries, processing transactions, and providing instant responses. According to the financial institution, "Eva" successfully resolved 85% of cases without manual intervention.

As for the Saudi National Bank (SNB) in Saudi Arabia, it uses artificial intelligence to precisely tailor its interactions with clients, relying on predictive analytics to suggest the most appropriate products or services based on past transactions and behavior. These tools are changing the way banking institutions in the region communicate with their clients, making financial services more accessible and personalized.

6-AI and Improving the Efficiency of Islamic Banks

Artificial intelligence is contributing to significant improvements in internal operations and banking processes in the Middle East. The combination of robotic process automation (RPA) and artificial intelligence allows banks to minimize human error, accelerate transaction processing, and optimize compliance. For example, Bank Muscat adopted AI-based solutions to optimize its Know Your Customer (KYC) procedures, significantly reducing manual verification time and errors associated with manual processes.

7-Key Challenges Related to AI Adoption

While artificial intelligence is widely adopted, several challenges remain, including data security and compliance with regulatory standards, as well as a lack of AI skills and expertise (Yahia ZAHIRI, 2013).

7-1-Data Security and Compliance with Regulatory Standards

The Central Bank of the United Arab Emirates, along with other regulatory authorities within the GCC, has established rigorous data governance rules, imposing requirements on the collection, storage, and processing of customer information. While the effectiveness of AI depends on large volumes of data, ensuring the secure management of this data is crucial to complying with personal data protection laws. Ameer Kamel . Cherfi Assia,2023).

For example, Bahrain's Personal Data Protection Law (PDPL) requires organizations, including banking institutions, to obtain explicit consent before handling personal data. This legislation poses challenges for AI-based applications, such as fraud detection and customer profiling, which require access to large amounts of data for their learning and decision-making processes. Therefore, financial institutions are forced to strike a delicate balance between technological innovation and compliance with regulatory standards.

7-2 Lack of AI skills and expertise

The availability of skilled professionals to lead AI innovation in banking is another significant challenge. While AI adoption has increased considerably, the region still faces a shortage of AI specialists, such as data scientists and machine learning engineers. To address this gap, several GCC banks are undertaking training initiatives and establishing collaborations with technology companies.

For example, Riyadh Bank in Saudi Arabia has partnered with international AI firms to enhance internal capabilities, focusing on developing AI skills for risk control and fraud detection. However, the supply of these specialized skills remains lower than the demand, leading banks to engage external consultants, which can increase project costs and limit internal knowledge sharing.

8-Prospects for AI Use:

8-1. Improving Fraud Detection and Optimizing Risk Management:

AI has enormous potential to radically transform fraud detection and risk management. GCC banking institutions are making significant investments in AI-powered technologies to review transaction information in real time, identify irregularities, and alert on suspicious activity.

Dubai Islamic Bank (DIB) has implemented sophisticated artificial intelligence models to monitor transactions and detect fraudulent activity. These systems can process massive volumes of data in seconds, enabling rapid detection and proactive risk management.

8-2. Artificial Intelligence for Financial Inclusion

AI is experiencing significant growth in the banking sector, particularly in the area of financial inclusion. AI-powered microcredit platforms in countries such as Oman and Bahrain are enabling banks to offer credit services to populations that previously struggled to access them.

By leveraging alternative data, such as mobile phone behavior and social media interactions, banking institutions can assess repayment capacity beyond traditional criteria.

For example, Mashreq Bank in the United Arab Emirates is implementing AI to provide small loans to small and medium-sized enterprises (SMEs), many of which previously had limited access to conventional banking services. This strategy not only promotes financial inclusion but also creates new revenue opportunities for banks willing to serve marginalized communities.

8-3. Artificial Intelligence in Islamic Banking

The use of artificial intelligence in Sharia-compliant banking services is a growing trend in the Middle East. Artificial intelligence is being integrated into platforms to ensure that financial products comply with the principles of Islamic finance. In Saudi Arabia, Al Rajhi Bank is at the forefront of innovation by implementing artificial intelligence to automate compliance checks, thus ensuring that its products meet Sharia requirements.

9-Context of Algeria

9-1- Features

Artificial intelligence is being implemented in the Algerian banking sector for automation and IT security, with concrete examples observed in traditional banks. Islamic finance is developing through products such as those offered by the BNA (National Bank of Algeria) and the 2026 sukuk (ijarah backed by public assets), which facilitates the future adoption of AI in line with

reforms. Regional projects, such as the IsDBI hackathon in Algiers in 2025, are exploring artificial intelligence for AAOIFI standards.

9-2-Challenges and Resolutions

The lack of Islamic transparency risks being compromised by algorithmic biases, opaque models, and insufficient Sharia-compliant datasets; there is a need for guidance on Sharia and ethical regulations. In Algeria/Maghreb, it is essential to train specialists and integrate BADR/ABE frameworks, based on the European AI Act. Sustainable adoption is ensured through the use of local datasets and hybrid governance.

9-3-Current Strategies and Initiatives

A number of banking institutions in Algeria have developed strategic guidelines for their digital transformation, extensively integrating artificial intelligence into customer relationship management, data processing, early fraud detection, and process automation. Institutions such as Al Baraka Algeria are adopting a strategy focused on improving customer experience, leveraging data, and implementing artificial intelligence solutions in order to transform into a modern and innovative digital bank by October 2023. <https://www.albaraka-bank.dz/les-axes-strategiques-de-la-strategie-digitale-al-baraka-algerie/>

Conclusion

The integration of AI into the banking sector in the Middle East is progressing rapidly, with the UAE, Saudi Arabia, Oman, and Bahrain leading the way. Despite significant growth opportunities, banks face major challenges related to data protection, regulatory compliance, and a skills gap to fully leverage the potential of artificial intelligence.

With the right strategy, strong governance, and a forward-thinking approach, artificial intelligence has the potential to significantly improve customer experience, increase operational efficiency, and promote financial inclusion in the region.

As the industry continues to advance, success will depend on banks' ability to align innovation with regulatory constraints and incorporate artificial intelligence into their overall strategic objectives. The lack of Islamic transparency risks being compromised by algorithmic biases, opaque models, and insufficient Sharia-compliant datasets. There is a need for guidance on Sharia and ethical regulations. <https://uabonline.org/magazine-article/exploiter-les-donnees-et-lia-faconner-lavenir-de-la-banque-dans-le-monde-arabe/> In Algeria, the use of AI is still in its

infancy. It is therefore essential to train specialists and adopt a sustainable and guaranteed Sharia-compliant framework through the use of local datasets and hybrid governance.

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