Iqtishodia: Jurnal Ekonomi Syariah
Program Studi Hukum Ekonomi Syariah,
Universitas Al-Qolam Malang
Jalan Raya Putatlor, Putatlor, Gondanglegi, Malang, Jawa Timur 65174, Indonesia.

ISSN (Print): 2503-118X, ISSN (Online): 2580-4669
Vol. 11(1), March 2026, pp. 1-13
DOI: https://doi.org/10.35897/iqtishodia.v11i1.2232

Big Data Analytics and Open Banking: A New Paradigm for Shariah-Compliant Financial Ecosystems

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ARTICLE INFO:

Article History:
.....
Received: November 2025
Revised: December 2025
Published: March 2026

Keywords:
Open Banking; Big Data Analytic; Shariah-Compliant Finance; Digital Transformation

Kata Kunci:
Open Banking; Big Data Analytic; Keuangan Syariah; Transformasi Digital

ABSTRACT

The rapid growth of financial technologies has given rise to new paradigms in the banking sector, with Open Banking and Big Data Analytics emerging as key drivers of innovation. This paper explores how these technologies can reshape the Shariah-compliant financial ecosystem, offering new opportunities for enhancing transparency, efficiency, and customer engagement. Methodologically, this study employs a qualitative approach based on a systematic literature review to examine relevant secondary data. Open Banking, which enables secure sharing of financial data between institutions, combined with Big Data Analytics, offers powerful tools for optimizing financial services, improving risk management, and ensuring Shariah compliance. By analyzing the intersection of these two technologies within Islamic finance, this study highlights their potential to enhance operational effectiveness while adhering to Shariah principles. The research discusses the challenges and opportunities presented by this integration, including issues of data privacy, regulatory compliance, and the need for Shariah governance. Ultimately, this paper aims to provide a framework for understanding how Big Data and Open Banking can work together to foster more inclusive, efficient, and innovative Shariah-compliant financial ecosystems.

ABSTRAK

Pertumbuhan pesat teknologi keuangan telah memunculkan paradigma baru di sektor perbankan, dengan Open Banking dan Big Data Analytics muncul sebagai pendorong utama inovasi. Artikel ini mengeksplorasi bagaimana teknologi ini dapat membentuk kembali ekosistem keuangan yang sesuai dengan syariah, menawarkan peluang baru untuk meningkatkan transparansi, efisiensi, dan keterlibatan pelanggan. Secara metodologis, penelitian ini menggunakan pendekatan kualitatif berbasis studi kepustakaan untuk menelaah data sekunder yang relevan. Open Banking, yang memungkinkan berbagi data keuangan yang aman antar institusi, dikombinasikan dengan Big Data Analytics, menawarkan alat canggih untuk mengoptimalkan layanan keuangan, meningkatkan manajemen risiko, dan memastikan kepatuhan syariah. Dengan menganalisis persimpangan kedua teknologi ini dalam keuangan Islam, penelitian ini menyoroti potensinya untuk meningkatkan efektivitas operasional sambil mematuhi prinsip-prinsip syariah. Penelitian ini membahas tantangan dan peluang yang dihadirkan oleh integrasi ini, termasuk masalah privasi data, kepatuhan terhadap peraturan, dan perlunya tata kelola syariah. Pada akhirnya, artikel ini bertujuan untuk memberikan kerangka kerja untuk memahami bagaimana Big Data dan Open Banking dapat bekerja sama untuk mendorong ekosistem keuangan yang lebih inklusif, efisien, dan inovatif yang sesuai dengan syariah.

***How to cite*:** Adriani, S, K & Mustofa, (2026). Big Data Analytics and Open Banking: A New Paradigm for Shariah-Compliant Financial Ecosystems. *Iqtishodia: Jurnal Ekonomi Syariah*, 11(1), 1-13. doi: https://doi.org/10.35897/iqtishodia.v11i1.2232

INTRODUCTION

The financial services industry has undergone significant transformation in recent years, largely driven by advancements in technology. One of the most significant developments is the emergence of Open Banking, a system that allows third-party financial service providers to access consumer banking data, facilitating innovation and enhancing customer-centric financial solutions((Haridan et al., 2023) Open Banking has fundamentally reshaped the relationship between banks and consumers, opening the door to more personalized, efficient, and accessible financial products and services (Shirazi et al., 2023). In parallel, the rise of Big Data Analytics has become a critical tool for analyzing large-scale financial data, offering deeper insights into consumer behavior, operational efficiencies, and risk management, which has had profound implications for the industry (Widjaja, 2024)These technological advancements present both opportunities and challenges within Shariah-compliant finance, where transactions must align with ethical principles that prohibit riba (interest) and gharar (speculation). Shariah-compliant financial systems require innovative approaches to ensure that these technologies do not violate these ethical guidelines (Ashraf, 2023). The application of Open Banking can contribute significantly to improving transparency and accessibility in Islamic financial services, creating new opportunities for Shariah-compliant products that meet the evolving needs of modern consumers (Haridan et al., 2020). Additionally, Big Data can enhance decision-making in Islamic finance by providing more accurate risk assessments, improving fraud detection, and enabling more precise customer profiling, all while maintaining compliance with Shariah law (Huda et al., 2024)

Despite these advancements, the application of Open Banking and Big Data Analytics has been primarily explored in the context of conventional banking systems, with limited attention given to their integration into Shariah-compliant finance (Fitria, 2025). Studies such as Haridan et al. (2020) have examined the role of financial technology in Islamic banking, demonstrating its potential to improve Shariah compliance through enhanced customer engagement and operational efficiency. However, many existing studies, including those by Gunawan (2024), have focused on Big Data applications in conventional systems without considering their unique challenges and applications in Shariah-compliant banking. This gap is particularly evident when reviewing the Islamic fintech space, where the potential synergy between Open Banking and Big Data has yet to be fully explored, particularly in terms of Shariah compliance (Sultan & Bechter, 2019).

Further research by Khan & Rabbani (2020)and Hassan Sain et al. (2025) has highlighted the integration of technology in Islamic finance, focusing on ethical implications but not thoroughly examining the practical use of AI and Big Data to ensure Shariah compliance. While Haridan et al. (2023)explored the role of Shariah boards and AI in Islamic banking, empirical research that bridges Open Banking and Big Data in Shariah-compliant ecosystems remains scarce. Notably, Arsyad et al. (2025)discuss how AI can assist in compliance monitoring but do not explore the crucial role that Big Data and Open Banking play in this process. This paper aims to fill this research gap by providing a framework that demonstrates how Big Data and Open Banking can collaborate to enhance operational efficiencies, ensure Shariah compliance, and create a more inclusive, transparent, and efficient Islamic financial ecosystem.

Originality and Contribution While previous studies have examined Big Data and Open Banking in isolation or within conventional frameworks, this research offers a distinct contribution by synthesizing these two disruptive technologies specifically within the Shariah-compliant financial ecosystem. Unlike Haridan et al. (2020) who focused primarily on general fintech inclusion, or Gunawan (2024) who discussed Big Data without addressing the specific regulatory nuances of Open Banking in Islamic finance, this study investigates the synergistic integration of both technologies. It provides a novel comprehensive framework that addresses the dual challenge of operational efficiency and strict Shariah-compliance specifically tackling issues of data privacy

(aurah) and ethical algorithmic decision-making which have been largely overlooked in prior empirical reviews. By bridging the gap between technical implementation and Shariah governance, this paper offers a roadmap for Islamic financial institutions to navigate the digital era without compromising their ethical foundations.

This paper investigates the convergence of Big Data Analytics and Open Banking within Shariah-compliant financial ecosystems, aiming to assess their potential to revolutionize the Islamic finance sector. The study will explore how Big Data can be harnessed to enhance risk management, improve customer profiling, and ensure the ethical alignment of financial products and services within an open, data-driven banking environment. By addressing the challenges of maintaining Shariah compliance, this research seeks to provide practical insights into how these technologies can be effectively integrated into Islamic finance, ensuring both innovation and ethical standards are upheld.

RESEARCH METHOD

This study employs a qualitative research design with a systematic literature review approach to explore the integration of Big Data Analytics and Open Banking within Shariah-compliant financial ecosystems. While quantitative methods are often used to measure adoption rates, a qualitative approach is deemed more appropriate for this study to disentangle the complex "black box" of algorithmic decision-making and its compatibility with Shariah ethics (Shariah governance). Following the framework suggested by Creswell & David Creswell (2018), this design allows for a deep exploration of multifaceted phenomena where variables are difficult to isolate. Specifically, the use of thematic analysis enables the researchers to move beyond mere description, allowing for the identification of underlying patterns regarding how technological efficiency serves or potentially conflicts with ethical Islamic principles such as the prohibition of *gharar* (uncertainty) and the protection of *aurah* (privacy).

To ensure the rigor and replicability of the review, this study adopted a systematic search strategy following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines adaptation for social sciences. The data collection process involved four distinct phases:

First, database selection, the search was conducted across reputable academic databases including Scopus, Google Scholar, and Dimensions, as well as relevant industry reports from bodies like AAOIFI and IFSB. *Second*, keyword strategy, the search utilized Boolean operators with the following keyword combinations: ("Open Banking" OR "Big Data Analytics") AND ("Islamic Finance" OR "Shariah Compliance" OR "Islamic Banking" OR "Fintech"). *Third*, inclusion and exclusion criteria, the selection was strictly limited based on the following criteria: Timeframe*:* Articles published between 2015 and 2025 to ensure technological relevance. Language: Papers written in English and Bahasa Indonesia. Relevance: Studies specifically discussing the intersection of technology and Islamic finance/ethics. Purely technical engineering papers without business or ethical implications were excluded. *Fourth*, Screening Process: A total of 150 initial documents were retrieved. After removing duplicates and screening titles/abstracts for relevance, documents were selected for full-text review and synthesis.

The selected literature was analyzed using thematic analysis as outlined by Braun and Clarke (2006b). This involved coding the data into key themes namely operational efficiency, customer engagement, and regulatory challenges and interpreting these themes through the lens of Shariah rules (*Maqasid Shariah*). Snyder (Koundyannan et al., 2020)notes that this method is particularly effective for synthesizing findings from diverse disciplines (finance, technology, and law) to build a cohesive theoretical framework.

In addition to academic literature, the study incorporates industry reports from global financial institutions and fintech companies. These reports provide practical insights into how Open Banking and Big Data are being implemented in Islamic finance, offering case studies and proprietary data from institutions that have adopted these technologies (Kumar Ranjit, 2019). Regulatory documents from organizations such as the Accounting

and Auditing Organization for Islamic Financial Institutions (AAOIFI) and the Islamic Financial Services Board (IFSB) are also analyzed to understand compliance requirements and the challenges Islamic financial institutions face in integrating modern technologies (Dyson et al., 2021)

The data is analyzed using thematic analysis, which is a common method in qualitative research for identifying, analyzing, and reporting patterns within the data (Braun & Clarke, 2006a). This method enables the study to examine how Big Data and Open Banking are integrated into Shariah-compliant finance while considering important factors such as Shariah compliance, data privacy, and regulatory challenges. After initial coding, themes are refined and relationships between them are explored to answer the research questions. Thematic analysis also allows for comparisons with existing studies on Big Data in conventional banking and the unique challenges faced by Shariah-compliant financial systems

Since the study relies on secondary data, ethical concerns focus on the proper handling and citation of sources. Saunders et al. (2023)emphasize the importance of ensuring all secondary sources are properly acknowledged to avoid plagiarism. This study strictly adheres to ethical guidelines by ensuring transparency in using secondary data, including reports and case studies. All data sources are cited in accordance with academic standards, and the study avoids using confidential or proprietary information that could violate privacy or intellectual property rights (Lincoln et al., 2018). The research also acknowledges its limitations and ensures that the findings are presented objectively.

RESULT AND DISCUSSION

The integration of Big Data Analytics and Open Banking in Shariah-compliant financial ecosystems presents a new paradigm for Islamic finance. This section discusses the major findings derived from secondary data analysis, including the potential benefits, challenges, and future implications of these technologies in enhancing Shariah compliance, operational efficiencies, and customer engagement.

Operational Efficiency and Customer Engagement

The integration of Big Data Analytics and Open Banking in Shariah-compliant financial ecosystems holds significant potential to improve both operational efficiency and customer engagement. By leveraging advanced data analytics and fostering secure data sharing, Islamic financial institutions can streamline their operations, offer personalized services, and enhance customer satisfaction while maintaining Shariah compliance. This section discusses the major findings regarding the impact of these technologies, with a focus on how they contribute to efficiency and customer satisfaction.

1. Improving Operational Efficiency

Big Data plays a pivotal role in improving operational efficiency in Shariah-compliant financial systems. By analyzing vast amounts of financial data, banks can identify inefficiencies, streamline processes, and enhance decision-making. According to Gunawan (2024), the use of Big Data enables banks to automate operations such as fraud detection and risk assessment, reducing manual labor and operational costs. Haridan et al. (2020) also highlight that Open Banking facilitates smoother internal processes by enabling seamless data sharing between banks and third-party providers. This integration not only enhances the overall operational efficiency but also helps banks respond more rapidly to market changes.

The figure below shows a data flow diagram illustrating how Big Data processes customer data from the initial transaction to final outcomes such as risk assessment and fraud alerts. The flowchart shows how Open Banking enables real-time data sharing across platforms, facilitating faster and more accurate decision-making. The flowchart also shows the flow of data from customer to bank and third-party providers, with integrated stages of data analysis, fraud detection and risk assessmen. Furthermore, Open Banking complements this by

facilitating seamless, real-time data sharing between banks and third-party providers (TPPs). This integration enables a more agile response to market changes, such as using AI-driven solutions to automate customer interactions via chatbots. To visualize how these technologies structurally interact to streamline banking operations, the proposed workflow is presented in Figure 1 below.

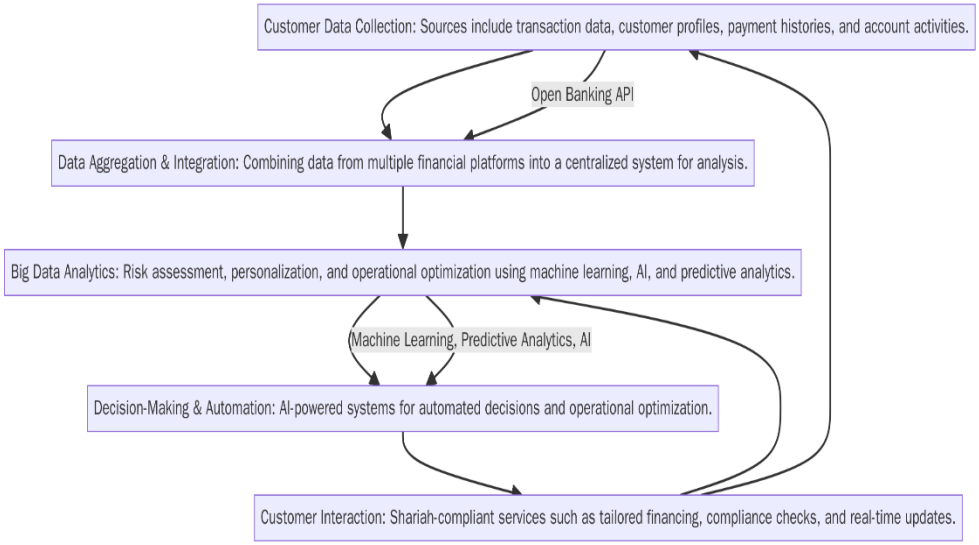

Figure 1: *Operational Efficiency Workflow: Big Data and Open Banking Integration in Shariah-Compliant Banking*

Kalogiannidis et al. (2024)emphasize that AI-driven solutions powered by Big Data can automate customer service, including chatbots and predictive systems, reducing response time and improving the efficiency of customer interactions. Haridan et al. (2023) also confirm that automation through Big Data allows banks to predict customer needs, resulting in better-targeted services that meet Shariah-compliant standards, enhancing overall operational efficiency.

2. Transforming Customer Experience: From Personalization to Trust

One of the most promising aspects of Big Data and Open Banking is their ability to enhance customer engagement through personalized services. By analyzing transaction history and financial goals via Open Banking APIs, banks can offer tailored products rather than generic solutions. Alsaghir (2023)argues that such personalized Shariah-compliant offerings significantly improve customer loyalty. Furthermore, Andariesta et al. (2022) and Zahid Iqbal & Campbell (2023) emphasize that integrating AI and machine learning allows for real-time recommendations that resonate with individual values while adhering to core Shariah principles, such as the prohibition of *riba*, *gharar*, and *maysir*.

This personalization is deeply connected to building trust. Setyowati et al. (2020) emphasize that Open Banking grants customers greater control over their data, fostering a sense of security. When institutions are transparent and aligned with ethical values, customers are more likely to engage deeply with the products (Hamadou et al., 2024; Omar & Sa'ad, 2024; Raza Rabbani et al., 2022). Moreover, Aldboush & Ferdous (2023) highlight that AI enhances this trust by providing timely responses to inquiries, ensuring that services meet both financial and ethical needs efficiently.

Consequently, this trust translates into higher customer retention. Gomber et al. (2017) and Zuhroh (2021)argue that data-driven personalization significantly reduces customer churn by improving the overall experience. This creates a dynamic feedback loop where banks continuously refine their offerings to remain relevant and efficient (Gautam & Chatterjee, 2020; Shirazi et al., 2023; Sultan & Bechter, 2019) To visualize

this continuous improvement process, Figure 2 outlines the cyclical nature of customer engagement within this ecosystem.

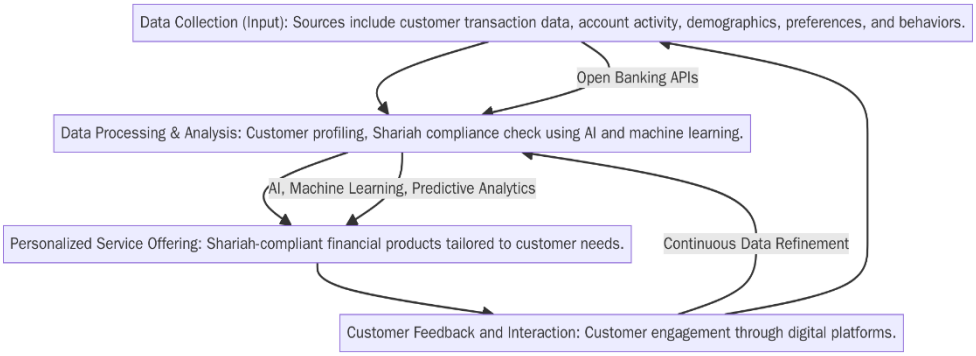

Figure 2: *Customer Engagement Cycle: Personalized Services through Big Data and Open Banking*

As detailed in the figure above, the integration of Big Data and Open Banking has revolutionized the way Shariah-compliant financial institutions interact with customers by offering personalized services that align with their financial goals and ethical preferences. Big Data enables banks to collect and analyze vast amounts of customer data, including transaction histories, account activities, preferences, and behaviors, which are sourced through Open Banking APIs. These insights allow for the creation of detailed customer profiles that can be used to offer Shariah-compliant financial products, such as financing solutions and investments. The use of advanced technologies like AI and machine learning enhances the ability to provide real-time recommendations and personalized banking experiences, ensuring that all offerings comply with core Shariah principles, such as the prohibition of *riba* (interest), *gharar* (excessive uncertainty), and *maysir* (gambling)..

Finally, the role of AI extends to ensuring the integrity of these relationships. Hendarti et al. (2024) and Kalogiannidis et al. (2024) highlight that AI automates risk assessment and fraud detection, while Aldboush et al. (2023) argue that it ensures automated compliance with Shariah laws. As noted by Dey et al. (2025) and Lasmiatun & Manteghi (2025), this continuous monitoring and adaptation allow banks to create a responsive, personalized, and ethically compliant banking experience that solidifies long-term customer relationships.

3. Regulatory Compliance and Ethical Considerations in Customer Engagement

The integration of Big Data and Open Banking into Shariah-compliant financial ecosystems brings significant opportunities for customer engagement but also raises concerns about regulatory compliance and ethical considerations. Wijaya (2025) emphasizes that the implementation of Open Banking requires a strong regulatory framework to ensure that customer data is handled in a way that is both ethical and secure. This is particularly important in Shariah-compliant finance, where customer data must be treated with the utmost confidentiality, aligning with Islamic values of privacy and transparency. Widjaja (2024)argues that Islamic financial institutions need to adhere to stringent data privacy laws and Shariah principles to maintain customer trust and ensure the ethical use of financial data. They propose that clear and robust regulations should govern how financial institutions collect, store, and share data, especially when it comes to using data for personalized services and predictive analytics. This regulatory framework should be designed to protect consumers' rights while fostering innovation within Islamic fintech.

Furthermore, Komaruddin et al.,(2023) discuss the importance of regulatory measures that enhance transparency and security in data sharing, particularly in the context of Shariah-compliant financial systems. They conclude that Islamic financial institutions must not only comply with conventional regulatory standards but also incorporate Shariah compliance into their data sharing frameworks. Aldboush et al. (2023) stress that customer trust is fundamental to the success of Open Banking and Big Data applications in Islamic finance.

They argue that by ensuring secure data sharing that aligns with Islamic ethical principles, banks can foster a higher level of customer engagement and loyalty. This would, in turn, lead to more personalized services that are Shariah-compliant, helping Islamic banks to better serve their customers while adhering to ethical standards.

In line with these views, Gomber et al.,(2017)suggest that Open Banking offers significant opportunities for Islamic financial institutions to engage with customers by providing more personalized services. However, the authors caution that, without clear regulatory guidelines, there is a risk of compromising Shariah compliance. They emphasize that the use of customer data in financial products and services must be aligned with Islamic principles, especially concerning data privacy. To this end, Islamic banks should develop internal policies and work closely with regulators to ensure that the adoption of Big Data and Open Banking technologies does not conflict with Shariah law.

Moreover, Cheah et al.,(2023) highlight the evolving role of artificial intelligence (AI) in ensuring regulatory compliance within Shariah-compliant banking systems. They argue that AI can help Islamic banks by automating compliance monitoring, ensuring that all transactions are Shariah-compliant. AI-powered data analytics systems can flag potential violations of Islamic finance principles in real-time, preventing errors and maintaining regulatory adherence without human intervention. This, in turn, enhances efficiency and accuracy in banking operations while fostering customer confidence in the security of their data.

Thus, regulatory compliance and ethical considerations are central to the successful implementation of Big Data and Open Banking within Shariah-compliant financial ecosystems. As Aziz & Khan (2022) and Soliman & Zaki (2020) note, adopting a robust regulatory framework ensures that customer data is handled securely, that Shariah compliance is maintained, and that customer trust and engagement are strengthened. The effective integration of AI, Big Data, and Open Banking requires that banks continuously monitor and adapt to evolving regulations, ensuring both data privacy and Shariah compliance.

Shariah Compliance and Ethical Alignment

The application of Big Data and Open Banking in Shariah-compliant finance provides significant operational benefits, but it also introduces ethical challenges that need to be carefully managed to ensure Shariah compliance. One of the central issues is ensuring that the use of Big Data for decision-making processes like fraud detection, credit scoring, and personalized financial products aligns with Islamic finance principles. As Gunawan (2024) point out, traditional data analysis practices, such as credit scoring, must be adapted to avoid elements like riba (interest) and gharar (excessive uncertainty) that are prohibited in Islamic finance. Almossawi (2020) further argues that financial institutions must ensure their data-driven decisions respect the ethical constraints inherent in Shariah law, emphasizing that AI and Big Data applications should not inadvertently encourage unethical financial practices.

Furthermore, Haridan et al. (2023) argue that Shariah boards must play an active role in regulating the use of Big Data and Open Banking within Islamic finance. These boards are crucial in ensuring that the data used to create financial products and services does not violate Shariah principles. Haridan et al. (2020) highlight that without proper oversight, banks may unknowingly offer financial products that, although innovative and efficient, could inadvertently involve haram elements, such as the use of interest-bearing loans. This underscores the importance of continuous Shariah compliance checks throughout the product development and data analysis processes.

In addition, Bakar & Ali (2022) stress the role of AI-powered systems in ensuring Shariah-compliant operations. They argue that while AI and machine learning can improve efficiency and accuracy in decision-making, they must be integrated with Islamic financial ethics. Bakar & Ali (2022) caution that the algorithms used in AI systems should be regularly reviewed and audited by Shariah boards to prevent any violations of Islamic finance principles. This continuous monitoring is essential in adapting AI tools to ensure that the outputs remain aligned with Shariah law, particularly as the technology evolves and new challenges arise.

Aziz & Khan (2022) argue that ongoing dialogue between Shariah scholars, financial regulators, and technology developers is necessary to create frameworks for using Big Data in a way that supports Islamic ethical principles. They highlight that Islamic financial institutions must not only focus on Shariah-compliant products but also on how technologies such as AI and Big Data can be utilized responsibly. This approach ensures that Shariah compliance is not just about avoiding financial misconduct but also about promoting ethical use of technology in Islamic banking.

In conclusion, the integration of Big Data and Open Banking into Shariah-compliant financial systems requires a careful and continuous effort to ensure that these technologies are aligned with Shariah principles. Shariah boards and regulatory bodies must remain vigilant, continuously auditing systems, and ensuring that innovations in banking technology serve to uphold Islamic values and ethics.

Regulatory and Data Privacy Challenges

As Open Banking and Big Data continue to transform Shariah-compliant finance, regulatory compliance and data privacy challenges emerge as critical areas for attention. The regulatory landscape for Big Data and Open Banking in Islamic finance is still evolving, with many countries yet to develop frameworks that fully address the unique needs of Shariah-compliant institutions. Wright & McMullin (2019) highlight that while regions like the European Union have implemented comprehensive regulations like PSD2 to govern data sharing and security, many Islamic financial institutions operate in regions where such regulations are not yet in place. This creates uncertainty, particularly in jurisdictions where Shariah-compliant institutions are required to adhere not only to local regulations but also to the ethical guidelines of Islamic finance.

Haridan et al. (2023) emphasize that Open Banking, which involves the sharing of financial data between various parties, presents a significant data privacy risk. As Haridan et al. (2023) explain, while Open Banking allows for greater customer engagement by enabling customers to share their financial data with different providers, it also exposes sensitive data to potential breaches or unauthorized access. Islamic finance places a premium on privacy and confidentiality, and thus, the implementation of Big Data and Open Banking must be done with stringent cybersecurity measures to mitigate the risks associated with data sharing.

Almossawi (2020) and Silverman (2016) underscore the importance of developing data privacy regulations that are specifically tailored to the needs of Shariah-compliant finance. Almossawi (2020) notes that data privacy is not only a regulatory concern but also a Shariah concern, as protecting customer data aligns with the Islamic principles of honesty, trust, and transparency. As Islamic financial institutions adopt Big Data and Open Banking, they must ensure that customer data is handled ethically, maintaining transparency about how data is used and shared while safeguarding confidentiality.

In addition to data privacy concerns, the regulatory landscape for Open Banking in Islamic finance requires continuous adaptation. Aziz & Khan (2022) argue that Islamic financial institutions need to work closely with regulators to create policies that address both technological advancements and Shariah compliance. They suggest that the introduction of Open Banking in Shariah-compliant systems should be guided by a framework that balances innovation with the protection of ethical values. Aziz & Khan (2022) recommend that regulators should develop clear guidelines for cross-border data sharing and data security to ensure that Islamic institutions can expand their digital services while still adhering to Islamic financial principles.

Finally, Goh & Lee (2022) discuss how AI and machine learning can assist in monitoring data privacy and ensuring Shariah compliance. They propose that AI systems can be integrated to conduct real-time compliance checks and flag any violations of Shariah law related to data handling. By using AI to track data flows and ensure they adhere to both regulatory and Islamic ethical standards, Islamic banks can proactively address data privacy concerns, creating a more secure and trustworthy system for customers. In conclusion, the integration of Big Data and Open Banking in Shariah-compliant finance requires robust regulatory frameworks and careful attention to data privacy. As these technologies evolve, Islamic financial institutions must work closely with

regulators to ensure that data-sharing practices are aligned with Shariah principles, protecting customer trust and ensuring that financial services remain both innovative and ethical.

Integration of AI and Blockchain with Big Data and Open Banking

The combination of AI, Big Data, and Open Banking presents significant opportunities for Shariah-compliant financial ecosystems, offering innovative solutions for enhancing both efficiency and compliance with Shariah law. AI technologies, such as machine learning, are particularly useful in automating decision-making processes, including risk management and fraud detection, which are critical for ensuring Shariah compliance in financial transactions. Haridan et al. (2020) suggest that AI can be used to analyze customer data in real-time to identify potential risks or fraudulent activities, ensuring that financial institutions adhere to Shariah principles and maintain integrity. AI's ability to automate these processes significantly reduces the risk of human error, making Islamic financial institutions more reliable and compliant with Islamic ethics.

In addition, Blockchain technology plays a crucial role in enhancing transparency and data immutability. According to Chusumastuti et al., (2023), Blockchain can complement Big Data and Open Banking by providing secure, transparent, and auditable records of all financial transactions. This feature of Blockchain ensures that every transaction is traceable, immutable, and verifiable, which is crucial for Shariah-compliant financial systems, as it guarantees that transactions comply with Islamic financial laws, such as prohibiting *riba* (interest), *gharar* (uncertainty), and *maysir* (gambling). This integration ensures that Islamic financial transactions remain transparent and accountable, promoting trust and compliance. To visualize how these automated systems practically function within an Islamic banking framework, Figure 3 outlines the specific integration of AI in decision-making processe

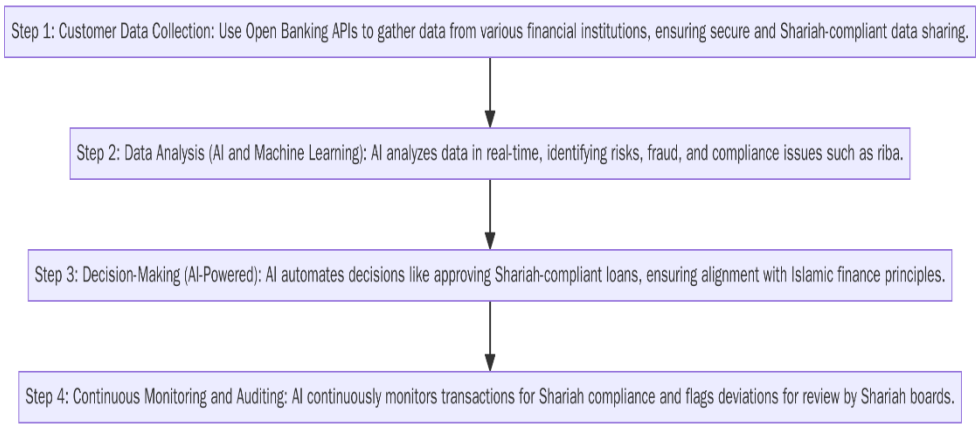

Figure 3: AI Integration in Shariah-Compliant Finance – Decision-Making and Risk Management

As depicted in the figure above, the AI architecture functions as a dual-layer filter: it processes Big Data for conventional risk assessment (such as credit scoring) while simultaneously running compliance algorithms to flag non-Shariah-compliant elements (like non-halal merchant codes). This visualization confirms that technology does not merely speed up processes but acts as an active gatekeeper for ethical compliance.

The integration of these technologies can also contribute to improving financial inclusion by offering more accessible Shariah-compliant products to a broader customer base. Haridan et al. (2023) emphasize that AI can be leveraged to create customer-centric financial solutions, especially for underbanked populations. By analyzing customer data, AI can identify specific financial needs and offer customized solutions, such as tailored financing or investment products, which are aligned with Islamic principles. In parallel, Blockchain's transparency ensures that these products are securely and ethically managed. However, Shirazi et al.,(2023) caution that Shariah boards must remain actively involved in overseeing the implementation of AI and

Blockchain technologies to ensure that they do not conflict with Islamic ethical standards. Their role is crucial in verifying that the financial products and services enabled by these technologies align with Shariah law.

Further, Sultan & Bechter, (2019) suggest that a comprehensive regulatory framework is essential for facilitating the widespread adoption of Big Data, AI, and Open Banking within Islamic finance. They argue that regulatory bodies must develop guidelines that address both the ethical use of these technologies and their integration into Shariah-compliant financial systems. A strong regulatory framework will help Islamic financial institutions navigate the complexities of adopting new technologies while ensuring that Islamic ethics remain at the forefront of financial practices. This regulatory development will be crucial for supporting the growth of Shariah-compliant fintech and ensuring that these technologies continue to benefit both financial institutions and their customers.

As Open Banking and Big Data technologies continue to evolve, future research must explore the long-term impact of these technologies on Shariah-compliant finance. There is a particular need for empirical studies to assess the effectiveness of AI and machine learning in improving compliance with Shariah law in real-world Islamic banks. Wijaya (2025) emphasizes the need for research that examines how Shariah boards can effectively integrate AI into their compliance monitoring processes. They also suggest that future studies should investigate the potential of AI to automate and streamline Shariah compliance audits, making the process more efficient and reducing the risks of human error.

Future research agendas must pivot towards the intersection of advanced technology and social impact, specifically focusing on financial inclusion. Artificial Intelligence holds significant potential to demystify underserved markets, enabling the engineering of micro-products that cater specifically to unbanked populations a trajectory strongly supported by Haridan et al. (2023). Simultaneously, as Islamic finance expands globally, the theoretical promise of Blockchain in securing cross-border transactions requires empirical validation. It is imperative for subsequent studies to assess whether the transparency mechanisms inherent in distributed ledgers can effectively replace traditional intermediaries while rigorously upholding Shariah accountability in international trade

CONCLUSION

This study set out to address the gap in understanding how Big Data Analytics and Open Banking can be synergized to create a robust Shariah-compliant financial ecosystem. By synthesizing recent theoretical and empirical literature, the research has successfully developed a conceptual framework that bridges the divide between technological disruption and ethical finance.

The findings demonstrate that the convergence of these technologies fulfills the study's primary objective: to provide a roadmap for operationalizing digital innovation while strictly adhering to Islamic principles. Specifically, the framework identifies three critical pillars: (1) Operational Efficiency, where Big Data automates risk assessment and fraud detection; (2) Customer-Centricity, where Open Banking transparency fosters trust and retention through personalized services; and (3) Dual Governance, where algorithmic auditing ensures compliance with both data privacy regulations and Shariah laws (*Maqasid Shariah*).

Ultimately, this paper concludes that the integration of Big Data and Open Banking is not merely a technical upgrade but a strategic imperative. It offers Islamic financial institutions a viable path to achieve competitive advantage without compromising their foundational religious values. Future implementations must prioritize the role of Shariah boards in auditing these algorithmic systems to ensure that the promise of innovation remains grounded in ethical integrity.

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