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Big Data and Artificial Intelligence for Fintech Innovation Systematic Literature Review

Muhammad Hatta[1*], Amroni[2], Rizky Charles Wijaya[3]
[1]Department of Information System, Catur Insan Cendekia University, Indonesia
[2]Faculty of Economics, Catur Insan Cendekia University, Indonesia
[3]Department of Information Technology, ADI Journal Incorporation, Germany
[1]muhammad.hatta@cic.ac.id, [2]amroni.75423007@mahasiswa.unikom.ac.id, [3]charlesboy10@adi-journal.org
***Corresponding Author**

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ABSTRACT

Big Data Analytics (BDA) and Artificial Intelligence (AI) have emerged as **key drivers of fintech innovation**, enabling financial institutions to improve operational efficiency, risk management, customer services, and data-driven decision-making. However, the growing literature remains fragmented, highlighting the need for a comprehensive synthesis of current knowledge. **Objective** This study aims to systematically review the literature on the integration of BDA and AI in fintech innovation, focusing on major research themes, applications, challenges, and future opportunities. **Method A Systematic Literature Review (SLR)** was conducted using the PRISMA framework. Relevant studies published between 2020 and 2025 were selected from major academic databases based on predefined criteria and analyzed using qualitative thematic analysis. **Results the findings** indicate that BDA and AI enhance fintech innovation through fraud detection, credit risk assessment, customer behavior prediction, personalized financial services, robo-advisory, and RegTech. Key challenges include data privacy, cybersecurity risks, algorithmic bias, limited AI explainability, regulatory uncertainty, and legacy system integration. Emerging technologies, including Explainable AI (XAI), federated learning, and generative AI, offer opportunities to improve transparency, trust, and scalability. **Conclusion the integration** of BDA and AI plays a strategic role in accelerating fintech innovation, supporting more intelligent, efficient, secure, and customer-centric financial services. This review synthesizes recent research, identifies key research gaps, and provides insights for future research and managerial decision-making to support sustainable fintech innovation.

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1. INTRODUCTION

The rapid evolution of digital technologies has transformed the global financial industry, with BDA and AI emerging as strategic enablers of fintech innovation [1]. BDA enables financial institutions to collect, process, and analyze massive volumes of structured and unstructured data, while AI enhances these capabilities through machine learning, deep learning, predictive analytics, and intelligent automation. In this study, fintech innovation refers to the development and improvement of financial products, services, processes, and

applications through digital technologies such as BDA and AI [2]. As financial services become increasingly digitalized, institutions face challenges including fragmented data, fraud, cybersecurity threats, inefficient credit assessment, slow decision making, and limited service personalization. The integration of BDA and AI addresses these challenges by supporting fraud detection, credit scoring, customer behavior analysis, personalized recommendations, digital payments, RegTech, and digital banking, while improving operational efficiency, decision making, cybersecurity, and customer experience [3].

Despite the increasing adoption of BDA and AI in fintech, the existing literature remains fragmented, with many studies examining these technologies independently or focusing on specific financial applications [4]. Limited research has systematically synthesized their combined contribution to fintech innovation and connected technological capabilities with operational efficiency, intelligent decision making, customer experience, financial inclusion, and organizational competitiveness [5]. Furthermore, challenges such as data privacy, cybersecurity, algorithmic bias, regulatory uncertainty, data quality, technology integration, and limited AI expertise have not been sufficiently integrated with the discussion of technological benefits. Therefore, this study employs a SLR to synthesize research on BDA and AI integration in fintech, identify major research themes, technological contributions, implementation challenges, and future research opportunities. The study aims to provide a comprehensive understanding of how these technologies contribute to the development of more intelligent, efficient, secure, and sustainable fintech ecosystems [6].

This study is aligned with several united nations Sustainable Development Goals (SDGs). It contributes to SDG 8 (Decent Work and Economic Growth) by supporting financial innovation and productivity, SDG 9 (Industry, Innovation, and Infrastructure) through advanced digital financial infrastructure and services, SDG 10 (Reduced Inequalities) by supporting financial inclusion through accessible and data driven financial services, and SDG 16 (Peace, Justice, and Strong Institutions) through improved financial transparency, fraud prevention, cybersecurity, and regulatory compliance [7]. Accordingly, this study contributes to the literature by providing a comprehensive synthesis of BDA and AI integration for fintech innovation, while offering theoretical and practical insights for researchers, financial institutions, fintech companies, technology developers, and policymakers seeking to develop innovative, secure, and sustainable digital financial ecosystems [8].

2. LITERATURE REVIEW

BDA and AI have become important technologies in fintech innovation [9]. Previous studies have examined their roles in improving financial services, operational efficiency, risk management, customer experience, and intelligent decision making. The increasing adoption of these technologies demonstrates their ability to transform traditional financial processes into more adaptive and data driven services [10]. This section reviews the roles of BDA and AI in fintech and discusses their integration as complementary technologies for supporting innovation in digital financial services. Furthermore, the discussion highlights how the combination of advanced data analytics and intelligent algorithms enables financial institutions to improve service quality, enhance decision accuracy, and develop sustainable financial ecosystems [11].

2.1. Big Data Analytics in fintech

BDA enables financial institutions and fintech companies to process and analyze large volumes of structured and unstructured data generated from financial transactions, customer interactions, and digital platforms [12]. Its application supports data driven decision making, operational efficiency, risk management, and customer analysis.

In fintech, BDA is applied to areas such as digital banking, fraud detection, credit assessment, investment services, and financial inclusion [13]. By providing the capability to identify patterns and extract useful information from large datasets, BDA establishes an analytical foundation for developing more responsive and data driven financial services.

2.2. Artificial Intelligence in fintech Innovation

Artificial Intelligence supports fintech innovation through predictive analysis, automated processes, pattern recognition, and intelligent decision making [14]. Machine learning and related AI techniques can identify complex patterns in financial data and support applications such as fraud detection, credit scoring, risk assessment, and customer behavior prediction.

AI is also increasingly applied to personalized financial services, robo advisory, digital banking, and RegTech. These applications can improve service delivery and decision accuracy while supporting more effi-

cient financial processes [15]. However, AI implementation also involves challenges related to explainability, algorithmic bias, cybersecurity, privacy, and regulatory requirements.

2.3. Integration of BDA and AI for fintech Innovation

BDA and AI provide complementary capabilities in fintech innovation. BDA focuses on processing and analyzing large and diverse datasets, while AI uses these data to generate predictions, automate processes, and support intelligent decisions [16]. Their integration therefore enables broader applications in fraud detection, credit scoring, customer personalization, investment services, digital banking, and financial inclusion.

Despite the growing literature on BDA and AI, previous studies often examine these technologies separately or focus on specific fintech applications [4]. A more integrated perspective is needed to understand their combined contributions, implementation challenges, and future opportunities. This study addresses this gap by systematically synthesizing research on BDA and AI within fintech innovation.

3. RESEARCH METHOD

3.1. Research Design

This study employs a SLR approach to examine the role of BDA and AI in driving fintech innovation [17]. The SLR methodology was selected because it enables a comprehensive synthesis of existing knowledge, identifies research trends, evaluates technological developments, and explores implementation challenges as well as future research opportunities related to BDA and AI within the fintech ecosystem.

To ensure methodological rigor, transparency, and reproducibility, this study follows the Preferred Reporting Items for Systematic Reviews and Meta Analyses PRISMA 2020 guidelines [18]. The PRISMA framework provides a systematic process for identifying, screening, assessing eligibility, and selecting relevant studies from multiple academic databases while minimizing selection bias throughout the review process [19].

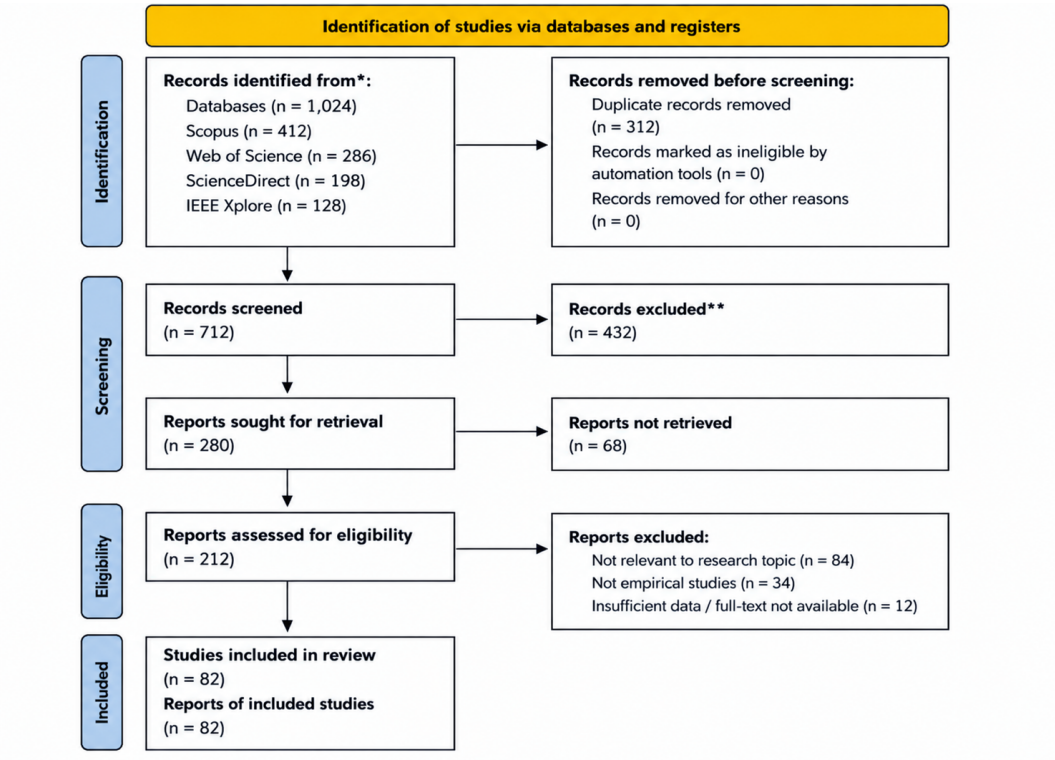


Figure 1. PRISMA 2020 Flow Diagram

Figure 1 presents the study selection process based on the PRISMA framework. A total of 1,024 records were initially identified from Scopus, Web of Science, ScienceDirect, and IEEE Xplore. After removing 312 duplicate records, 712 records remained for screening, of which 432 were excluded [20]. Subsequently, 280 reports were sought for retrieval, while 68 reports were not retrieved. A total of 212 reports were assessed

for eligibility, resulting in the exclusion of 130 reports due to irrelevance to the research topic, lack of empirical evidence, or insufficient data/full text availability. Finally, 82 studies were included in the SLR

3.2. Data Collection and Selection Criteria

The literature search was conducted using four major academic databases, namely Scopus, Web of Science, ScienceDirect, and IEEE Xplore [21]. These databases were selected because they contain high quality peer reviewed publications covering financial technology, artificial intelligence, BDA, information systems, and digital innovation.

The search strategy utilized Boolean combinations of keywords related to BDA, AI, and fintech innovation. The general search string was formulated as follows BDA OR AI OR Machine Learning OR Predictive Analytics AND fintech OR Financial Technology OR Digital Finance OR Financial Innovation [22]. The search strategy was applied to Scopus, Web of Science, ScienceDirect, and IEEE Xplore and was limited to English language journal articles published between 2020 and 2025. The search results were subsequently screened according to the predefined inclusion and exclusion criteria [23]. To ensure the quality and relevance of the selected studies, inclusion and exclusion criteria were established as shown in Table 1.

Table 1. Inclusion and Exclusion Criteria

Criteria	Inclusion	Exclusion
Publication Year	2020–2025	Before 2020
Language	English	Non-English
Document Type	Journal Articles	Books, Editorials, Conference Proceedings
Research Topic	BDA, Artificial Intelligence and fintech Innovation	Unrelated Topics
Accessibility	Full-text Available	Abstract Only

As shown in Table 1, the inclusion and exclusion criteria were defined to ensure that the selected studies were relevant to the objectives of this SLR [24]. The criteria covered publication year, language, document type, research topic, and full text accessibility. Accordingly, the review included English language journal articles published between 2020 and 2025 that focused on BDA, AI, and fintech Innovation, while studies that did not meet these criteria were excluded [25].

3.3. Bibliometric Analysis

Bibliometric analysis was performed using VOSviewer to identify research trends and intellectual structures within the domain of BDA, AI, and fintech innovation [26]. This method enables visualization of relationships among publications, authors, citations, and keywords while identifying dominant research themes and emerging research directions. The bibliometric analysis focused on

- Keyword Co-occurrence Analysis
  This analysis identifies keywords that frequently appear together in the selected studies to reveal relationships among research topics. It helps identify the main research themes and clusters related to BDA, AI, and fintech innovation.

- Citation Analysis
  Citation analysis examines citation relationships among the selected publications to identify influential studies and relevant research connections. This analysis provides an overview of the academic impact and development of research within the field.

- Research Cluster Mapping
  Research cluster mapping visualizes relationships among keywords and research topics to identify distinct thematic clusters. In this study, the mapping highlights the relationships between BDA, Artificial Intelligence, and fintech Innovation.

- Publication Trend Analysis
  Publication trend analysis examines the development of research publications over the selected period. This analysis helps illustrate changes in research activity and the development of interest in BDA, AI, and fintech innovation.

- Research Trend Identification
  Research trend identification is used to determine dominant and emerging research directions within the reviewed literature. The analysis helps identify how research has developed from data analytics and AI techniques toward broader fintech applications such as digital banking, fraud detection, credit scoring, and customer experience.

The results generated by VOSviewer provide insights into dominant research themes and emerging directions concerning the application of BDA and AI in fintech innovation [27]. The keyword co occurrence analysis identifies three main research clusters, namely BDA, AI, and fintech Innovation. The mapping also highlights related keywords such as machine learning, predictive analytics, deep learning, neural networks, digital banking, fraud detection, credit scoring, risk management, and customer experience [28]. These keyword relationships indicate that research has evolved from data processing techniques toward broader applications involving financial innovation, digital banking, customer centric services, and sustainable fintech ecosystems. These findings further demonstrate the close relationship between analytical capabilities, intelligent technologies, and practical financial applications across the evolving fintech research landscape and business contexts [29].

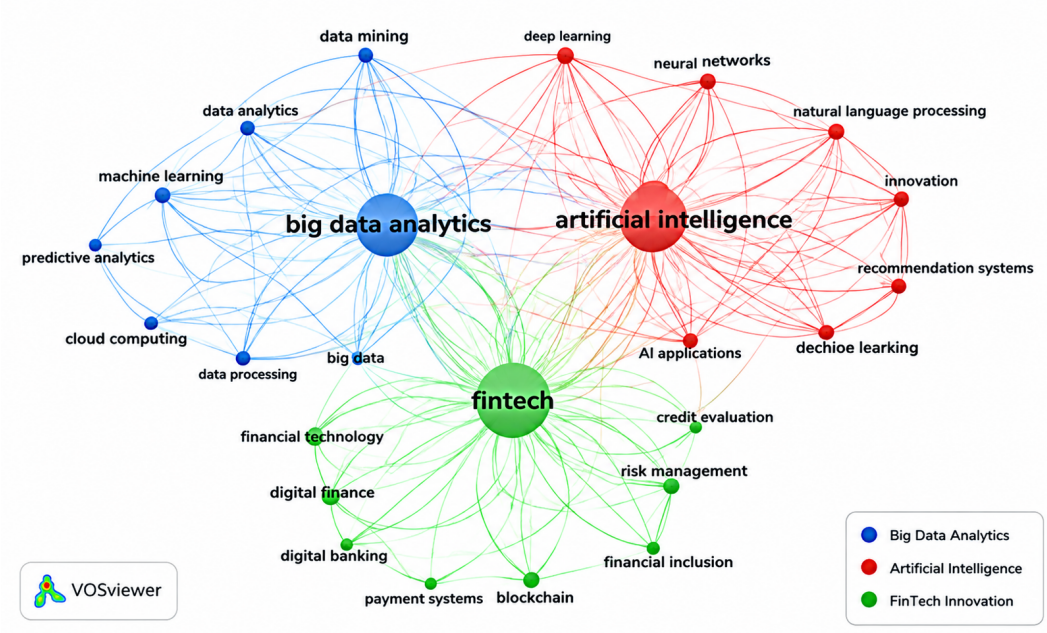


Figure 2. Keyword Network using VOSviewer

Figure 2 presents the keyword co occurrence network generated using VOSviewer. The visualization identifies three main research clusters BDA, Artificial Intelligence, and fintech Innovation [30]. The BDA cluster is associated with keywords such as machine learning, data analytics, predictive analytics, data mining, and big data, while the Artificial Intelligence cluster includes deep learning, neural networks, natural language processing, automation, and AI applications. The fintech Innovation cluster is connected with financial technology, digital finance, digital banking, payment systems, blockchain, credit evaluation, risk management, and financial inclusion. The connections between the clusters indicate the relationship between data analytics, AI technologies, and fintech applications within the reviewed literature [31].

3.4. Thematic Coding Analysis

Following the bibliometric analysis, a thematic coding analysis was conducted to systematically classify and interpret findings from the selected studies [32]. This approach facilitates the identification of recurring concepts and innovation patterns related to the implementation of BDA and AI in fintech. The coding process was performed by categorizing relevant findings into predefined themes, including fintech innovation, operational efficiency, fraud detection, intelligent decision making, customer experience, financial inclusion, risk management, and implementation challenges [33]. These themes were subsequently analyzed to identify

common patterns, technological contributions, application areas, and emerging challenges within the fintech ecosystem. The analysis also provides insights into future research opportunities and strategic considerations for digital financial transformation [34].

The coding process generated several major themes including fintech Innovation, Operational Efficiency, Fraud Detection, Customer Experience, Financial Inclusion, Risk Management, Intelligent Decision Making, and Implementation Challenges [35]. These themes were used to organize and synthesize the findings from the reviewed studies, allowing the research to identify the main contributions, application areas, benefits, and limitations associated with the implementation of BDA and AI in fintech innovation [26]. Furthermore, the thematic classification supports a deeper understanding of how technological capabilities influence financial transformation, service improvement, and the development of sustainable digital finance ecosystems.

Table 2. Thematic Coding Categories

Code	Theme
FIN	Fintech Innovation
OPE	Operational Efficiency
FRA	Fraud Detection
DEC	Intelligent Decision-Making
CEX	Customer Experience
FINC	Financial Inclusion
RSK	Risk Management
CHA	Implementation Challenges

As shown in Table 2, the thematic coding process identified eight major themes that represent recurring concepts in the reviewed studies [36]. These themes were used to structure the analysis of BDA and AI contributions, applications, outcomes, and challenges within the fintech ecosystem. The identified themes provide a systematic framework for interpreting the relationships between technological capabilities and their impact on financial innovation, operational improvement, customer experience enhancement, and sustainable digital financial development.

3.5. Research Tools

Several analytical tools were employed throughout the research process to improve the validity, transparency, and reliability of the findings. These tools supported systematic data examination, enhanced the accuracy of the analysis, and ensured that the obtained results were interpreted based on rigorous methodological procedures [37]. The integration of multiple analytical approaches also enabled comprehensive evaluation of the proposed framework, identification of significant patterns, and validation of the research outcomes from both theoretical and practical perspectives.

Table 3. Research Tools and Functions

Tool	Function
PRISMA 2020	Literature identification and screening
VOSviewer	Bibliometric network visualization
Microsoft Excel	Literature identification and screening
Tableau	Publication trend visualization
Mendeley	Reference management
Thematic Coding Analysis	Theme identification and synthesis

Table 3 presents the analytical tools employed in this study and their respective functions. The integration of systematic review tools, visualization software, reference management applications, and thematic analysis techniques ensured a structured, transparent, and reliable research process.

4. RESULT AND DISCUSSION

The SLR identified that BDA and AI have become fundamental technological capabilities supporting fintech innovation [38]. Based on the analysis of 82 selected studies published between 2020 and 2025, the

findings reveal that the integration of BDA and AI has shifted financial services from conventional data processing toward intelligent, predictive, and automated ecosystems. The reviewed studies consistently highlight that BDA provides large scale data processing capabilities, while AI enhances analytical intelligence through machine learning, predictive modeling, and automated decision making [39].

The synthesis results indicate that BDA and AI contribute to multiple dimensions of fintech transformation, including operational efficiency, financial decision making, customer experience enhancement, fraud prevention, and financial inclusion [40]. However, the findings also demonstrate that technological adoption requires addressing several challenges, including data privacy, cybersecurity, algorithmic transparency, regulatory compliance, and organizational readiness. Therefore, the discussion focuses on three major themes identified from the literature technological contributions, application domains, and implementation challenges [41].

4.1. Role of Big Data Analytics and Artificial Intelligence in fintech Innovation

The reviewed studies demonstrate that BDA and AI function as complementary capabilities that accelerate fintech innovation [42]. BDA enables organizations to collect, integrate, and analyze complex financial datasets generated from transactions, customer interactions, digital platforms, and external data sources. Meanwhile, Artificial Intelligence transforms these datasets into actionable insights through predictive analytics, machine learning algorithms, and intelligent automation. This integration allows financial institutions to develop more adaptive, efficient, and customer oriented services. Furthermore, these capabilities support data driven strategies, improve decision accuracy, and strengthen innovation capacity within rapidly evolving digital financial ecosystems [43].

Furthermore, the combination of BDA and AI strengthens organizational capabilities by enabling real time analysis, improving financial risk assessment, enhancing service personalization, and supporting strategic decision making. These capabilities facilitate the development of intelligent financial ecosystems where data driven innovation can improve competitiveness, operational resilience, and long term value creation within the evolving fintech landscape. Moreover, the integration of these technologies enables financial organizations to optimize resource utilization, enhance service reliability, and identify emerging market opportunities through continuous data analysis. The findings also suggest that successful adoption of BDA and AI requires alignment between technological capabilities, organizational strategies, and responsible governance practices to maximize sustainable innovation outcomes.

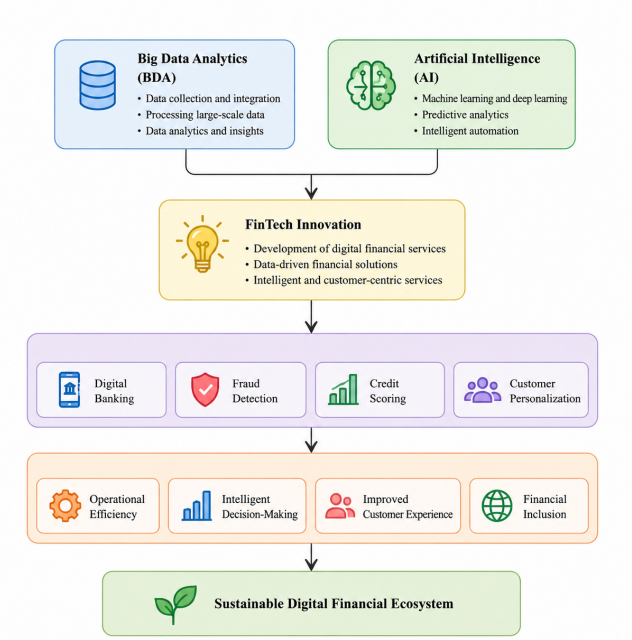


Figure 3. Integrated BDA and AI Framework for fintech Innovation

Figure 3 illustrates the integrated relationship between BDA, AI, and fintech innovation derived from the thematic synthesis. The framework highlights that BDA and AI provide interconnected capabilities where data driven processing supports intelligent analysis and automated decision making. These capabilities enable various fintech applications, including digital banking, fraud detection, credit scoring, and customer personalization, which ultimately improve financial service quality and organizational performance. Furthermore, the framework demonstrates that the synergy between BDA and AI extends beyond technological adoption by creating strategic value through enhanced operational efficiency, improved customer experience, stronger risk management, and more accurate financial decision making. This integration supports the development of sustainable digital financial ecosystems by enabling organizations to respond effectively to evolving market requirements and continuous technological advancements.

4.2. Emerging Applications and Value Creation in Digital Finance

The findings indicate that BDA and AI applications have expanded across various fintech domains [44]. Fraud detection and risk management represent some of the most frequently discussed applications, where AI based models analyze transaction patterns to identify abnormal activities and reduce financial risks. Similarly, credit scoring systems increasingly utilize predictive analytics to evaluate customer profiles more accurately and support faster lending decisions. In addition, these technologies contribute to investment services, digital banking, and personalized financial solutions by enabling organizations to understand customer behavior and optimize service delivery. The integration of BDA and AI allows financial institutions to improve accuracy, increase operational responsiveness, and develop innovative financial products that align with changing customer expectations and market dynamics [45].

Beyond operational improvement, BDA and AI also contribute to customer oriented innovation. AI powered recommendation systems and behavioral analytics enable financial institutions to provide personalized services based on customer preferences and financial behavior. These capabilities improve customer engagement while supporting broader financial inclusion by enabling accessible and data driven digital financial services.

4.3. Implementation Challenges and Future Research Directions

Although BDA and AI provide significant benefits for fintech innovation, the literature identifies several challenges that influence successful implementation. Data privacy protection, cybersecurity threats, algorithmic bias, and regulatory uncertainty remain critical concerns because financial systems require high levels of trust, transparency, and security. Furthermore, difficulties in integrating AI solutions with legacy financial infrastructures and limited availability of AI expertise may restrict organizational adoption.

Future research should focus on developing responsible and explainable AI approaches, including Explainable AI (XAI), federated learning, and ethical AI governance frameworks. These approaches can improve transparency, reduce algorithmic risks, and strengthen user confidence. Additionally, future studies should explore how BDA and AI can support sustainable fintech ecosystems by balancing technological innovation, security, accessibility, and regulatory requirements.

5. MANAGERIAL IMPLICATION

The findings of this study provide several managerial implications for financial institutions, fintech companies, and technology driven organizations seeking to accelerate digital transformation. The integration of BDA and AI should be considered not only as technological investments but also as strategic capabilities that enable intelligent financial services. Managers should develop data driven strategies by strengthening data infrastructure, improving analytical capabilities, and integrating AI based solutions to support predictive decision making, fraud detection, credit assessment, and personalized customer services. These approaches can enhance operational efficiency while improving organizational responsiveness to dynamic financial environments.

Furthermore, managers should prioritize responsible AI governance to ensure that technological adoption creates sustainable value. The findings highlight that challenges related to data privacy, cybersecurity risks, algorithmic bias, regulatory uncertainty, and legacy system integration remain critical barriers to successful BDA and AI implementation. Therefore, organizations need to establish strong data governance frameworks, cybersecurity mechanisms, regulatory compliance strategies, and employee capabilities in data analytics and AI management. Ensuring transparency and explainability in AI driven decision making is also essential to maintain customer trust and strengthen the reliability of intelligent financial services.

From a strategic perspective, organizations should leverage BDA and AI to create broader financial innovation and inclusive digital ecosystems. Managers can utilize these technologies to expand accessible financial services, improve customer engagement through personalization, and develop innovative products aligned with evolving market needs. Additionally, the adoption of intelligent financial technologies can support sustainable development objectives by improving financial accessibility, strengthening digital infrastructure, and promoting secure financial systems. Therefore, successful fintech transformation requires a balanced approach that combines technological innovation, organizational readiness, ethical governance, and sustainable value creation.

6. CONCLUSION

This study employed a SLR to examine the integration of BDA and AI in fintech innovation. The review synthesizes their contributions across various domains, including digital banking, mobile payments, credit scoring, fraud detection, customer personalization, investment services, and financial inclusion. The findings reveal that BDA and AI significantly contribute to operational efficiency, intelligent decision making, improved financial services, and inclusive digital finance. Furthermore, these technologies support the development of innovative financial solutions, including digital banking, credit scoring, personalized financial products, and automated financial processes. By combining bibliometric analysis and thematic coding, this study provides an integrated synthesis of technological contributions, fintech applications, implementation challenges, and SDG related implications.

Despite their significant benefits, the review identifies several challenges that may hinder successful BDA and AI implementation in fintech ecosystems. These challenges include data privacy, cybersecurity risks, algorithmic bias, data quality issues, regulatory uncertainty, compliance requirements, technology integration complexity, and limited AI expertise. These findings emphasize the importance of effective governance frameworks, responsible AI practices, organizational readiness, and strategic technology management to ensure that intelligent financial technologies can be implemented securely, transparently, and sustainably.

The novelty of this study lies in providing an integrated systematic synthesis of BDA and AI as complementary technological capabilities for fintech innovation. Unlike previous reviews that mainly examined AI, Big Data, or specific fintech applications separately, this study jointly analyzes how BDA and AI contribute to major fintech domains while identifying research patterns, implementation barriers, and future development directions through bibliometric analysis and thematic coding. Overall, this study concludes that the integration of BDA and AI plays a strategic role in creating innovative, secure, and sustainable financial ecosystems. The findings provide valuable theoretical insights and practical implications for researchers, financial institutions, fintech companies, and policymakers seeking to accelerate digital financial innovation while supporting SDGs, particularly SDG 8, SDG 9, SDG 10, and SDG 16.

7. DECLARATIONS

7.1. About Authors

Muhammad Hatta (MH) https://orcid.org/0000-0002-1892-9008

Amroni (AA) https://orcid.org/0009-0008-6742-359X

Rizky Charles Wijaya (RC) https://orcid.org/0009-0003-8655-1339

7.2. Author Contributions

Conceptualization: MH; Methodology: AA; Software: RC; Validation: RC and MH; Formal Analysis: AA; Investigation: RC; Resources: MH; Data Curation: RC; Writing Original Draft Preparation: AA and WH; Writing Review and Editing: RC and MH; Visualization: AA; All authors, MH, AA and RC have read and agreed to the published version of the manuscript.

7.3. Data Availability Statement

In line with our commitment to research transparency, the dataset underlying this study has been archived in the Zenodo Repository https://doi.org/10.5281/zenodo.22825398.

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7.5. Declaration of Conflicting Interest

The authors declare that they have no conflicts of interest, known competing financial interests, or personal relationships that could have influenced the work reported in this paper.

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