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A Legal Analysis Of Artificial Intelligence (AI) Regulations: A Study Of Consumer Protection In The Banking Sector

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Abstract

The development of artificial intelligence in the banking sector has driven improvements in efficiency and service quality, while simultaneously giving rise to legal risks for consumers. This research aims to analyze the forms of AI implementation in Indonesian banking services and to assess the effectiveness of the Financial Services Authority (Otoritas Jasa Keuangan/OJK) regulations in ensuring consumer protection. This study employs a normative legal research method with a qualitative approach through library research. The data are obtained from statutory regulations, OJK regulations and guidelines, as well as relevant scholarly literature. The findings indicate that the application of AI in credit analysis, electronic know-your-customer (e-KYC), biometric authentication, and chatbots has the potential to weaken customer protection due to the risks of algorithmic bias, the black box phenomenon, and vulnerabilities in personal data. The current OJK regulatory framework is considered ineffective because it remains fragmentary, is dominated by soft law instruments, and has yet to regulate substantive transparency standards and operational obligations for human oversight. This research also highlights the need for clearer, more specific, and more accountable regulations to ensure effective consumer protection in banking services that apply AI-based technologies.

INTRODUCTION

The world is currently in the midst of the Fourth Industrial Revolution, characterized by the convergence of digital, physical, and biological technologies that are fundamentally transforming the way people live and work. One of the main pillars of this revolution is AI technology capable of processing vast amounts of data, learning

from patterns, and making autonomous decisions. AI has become a key driver of innovation across sectors, including finance and banking(Ridzuan et al., 2024).

The adoption of AI in the banking industry is no longer optional but a strategic necessity to enhance efficiency, security, and competitiveness. A 2024 Statista report estimates that the AI market value in the banking, financial services, and insurance (BFSI) sector will reach 24.7 billion U.S. dollars by 2025. Banks worldwide are integrating AI into various critical functions, such as chatbots and voice banking, credit risk analysis, real-time detection of suspicious transactions, and the personalization of products and services. The implementation of AI has proven to improve operational efficiency and decision-making accuracy, but it simultaneously raises new challenges in legal, ethical, and consumer protection aspects(Qureshi et al., 2024).

In Indonesia, the digital transformation of banking is progressing at a rapid pace. Data from Bank Indonesia shows that the value of digital banking transactions reached Rp87 quadrillion as of December 2024, an increase of 50.6 percent compared to the previous year. This growth is driven by changes in consumer behavior and the use of AI technology in banking services, such as conversational banking, hyper-personalization, and AI-based fraud detection. In the first quarter of 2024 alone, the value of digital banking transactions reached Rp5,836.36 trillion. This reflects the massive adoption of digital technology and AI in the national banking sector while expanding access to financial services for the public(Ngozi Samuel Uzougbo et al., 2024).

However, the implementation of AI in banking also raises complex legal consequences, particularly regarding consumer protection. The use of AI based on big data increases the risk of privacy violations and breaches of customers' personal data security. Furthermore, the "black box" nature of AI algorithms results in low transparency in decision-making, making it difficult for consumers to obtain explanations for decisions that directly impact their rights, such as loan rejections. This situation has the potential to conflict with consumers' right to clear and accurate information as stipulated in Law No. 8 of 1999 on Consumer Protection(Hani et al., 2025).

Another issue that arises is the potential for algorithmic bias within AI systems, particularly in creditworthiness assessments. Bias can arise from unbalanced training data or non-neutral algorithm design, potentially leading to discrimination and injustice in banking services. Therefore, legal protection for consumers is becoming increasingly important to ensure that technological advancements do not cause new harm to society(Owolabi et al., 2024).

The Financial Services Authority (OJK), as the regulator of the financial services sector, has issued various regulations, such as OJK Circular Letter No. 29/SEOJK.03/2022 and POJK No. 22 of 2023, which govern technology risk management, cybersecurity, and consumer data protection. Article 19 of POJK No. 22 of 2023 reaffirms the obligation of Financial Services Institutions (PUJK) to maintain the confidentiality and security of consumer data and imposes administrative sanctions for violations of such obligations. Additionally, banks are required to comply

with Government Regulation No. 71 of 2019 on the Payment Services and Electronic Transactions Act (PSTE) and Law No. 27 of 2022 on Personal Data Protection(Agustianto et al., 2025).

Although various legal instruments are available in principle, these regulations have not yet specifically accommodated the unique characteristics of AI, such as the obligation of explainability, mitigation of algorithmic bias, and clarity regarding legal liability for automated decisions. To address these needs, in April 2024, the OJK issued AI Governance Guidelines emphasizing the principles of transparency, accountability, ethics, inclusivity, consumer protection, and the importance of human oversight in high-risk decision-making.(Yuspin et al., 2023)

However, the implementation of these guidelines still faces various challenges, including the gap between the pace of technological innovation and regulatory adaptation, limited human resources, and suboptimal enforcement mechanisms. Therefore, a study titled "Legal Analysis of AI Regulation: A Review of Consumer Protection in the Banking Sector" is needed to analyze the effectiveness of the OJK's guidelines in ensuring legal protection for consumers, as well as to provide recommendations for strengthening policies so that the application of AI aligns with the principles of good governance, transparency, and fairness.

METHOD

This study is a normative legal research project focused on the examination and analysis of positive legal norms related to the application of AI in the Indonesian banking sector, particularly regarding consumer protection. In this normative legal analysis, the study compares das sollen (the ideal norms that should govern) and das sein (the current factual legal conditions).

Data collection for this study was conducted through a literature review by examining primary, secondary, and tertiary legal materials. The data analysis technique in this study employs a normative legal approach using a descriptive-qualitative method, examining the alignment between existing legislation and consumer protection principles, identifying weaknesses in the implementation of AI governance in the banking sector, and formulating normative recommendations to strengthen consumer protection. Through this analysis, the study aims to provide a comprehensive overview of the implementation of AI governance in the Indonesian banking sector while offering normative and practical policy recommendations to enhance the effectiveness of consumer protection in accordance with OJK guidelines and the dynamics of the banking industry's digital transformation.

RESULTS AND DISCUSSION

Forms of AI Implementation in Banking Services in Indonesia

AI is a computing-based technology designed to mimic human thinking and decision-making capabilities through algorithms and data processing. AI enables the automation of decision-making and task execution in a consistent and efficient manner, thereby potentially replacing human roles in various sectors, including

banking. Nevertheless, every action taken by AI remains, in essence, under human control as its designers and users, thereby raising legal implications that require clear regulations to ensure the protection of human and consumer interests(Agustiawan, 2024).

In the banking sector, AI has become a strategic technology supporting digital transformation through improved operational efficiency, decision-making accuracy, and service personalization. AI is used comprehensively across strategy, internal processes, and customer experience, and is applied to front-office, middle-office, and back-office functions, such as chatbot services, credit risk assessment, fraud prevention, e-KYC, biometric authentication, and compliance management. The high level of AI adoption globally and nationally indicates that this technology has become an integral part of modern banking business strategies(Maspul & Putri, 2025).

Indonesia falls into the category of "rising contenders" in AI adoption, supported by national policies through the Indonesia National AI Strategy 2020–2045, which emphasizes the principles of human welfare, the values of Pancasila, accountability, security, and stakeholder synergy. A survey by the Financial Services Authority in collaboration with the World Bank indicates that the majority of banks in Indonesia have implemented AI, particularly in risk management and fraud detection, and plan to expand its application in the coming years. However, there are disparities in capacity between large and small banks, particularly regarding resources and AI governance(Muhammad Bashri Bas et al., 2025).

Based on information gathered regarding the implementation of banking services in Indonesia, the following are some of the most frequently used features:

Table 1. Legal and Consumer Protection Issues in AI-Driven Banking Services

Type of AI Service	Risks to Consumers	Regulatory Challenges
AI-based credit scoring	Algorithmic bias and credit denial without explanation	No explicit obligation for the right to explanation of AI decisions
AI-based e-KYC	Rejection of account opening without an appeal mechanism	Human review or oversight mechanisms are not yet clearly regulated
Biometric authentication	Data breaches and misuse of biometric data	Specific standards for biometric data protection are not yet well defined
Chatbots or virtual assistants	Misinformation and failure in handling complaints	No minimum quality standards for AI services

1. AI-Based Credit Scoring

Credit scoring is a statistical analysis technique used by banks to assess the creditworthiness of prospective borrowers based on a specific score. Conventional methods typically rely on historical financial data, such as payment history and loan amounts. Following the 2008 Global Financial Crisis, innovative credit scoring (ICS) methods emerged that leverage AI and machine learning by combining financial data with alternative data. In Indonesia, this practice began to develop in 2016 and has been adopted by several banks, such as KB Bank, BRI, and BTN, as well as fintech companies(Clara Ignatia Tobing et al., 2024).

The use of AI-based credit scoring systems raises several issues for consumers. These systems have the potential to produce unfair decisions if the training data contains biases or discriminatory elements. Consumers also often do not receive adequate explanations for credit rejections because the AI decision-making process is difficult to understand. This situation risks undermining the principles of transparency, fairness, and consumers' right to information(Hamadou et al., 2024).

Additionally, the application of machine learning in credit scoring carries the risk of algorithmic bias the tendency of the system to replicate and reinforce existing social inequalities in historical data. Factors such as region, gender, or economic status can lead to certain groups being assessed as higher-risk without considering the broader context. Another significant issue is the lack of transparency, as many AI systems operate as black boxes, making ethical and legal oversight difficult(Tjahyono et al., 2025).

2. AI-Based e-KYC

The use of AI-based electronic Know Your Customer (e-KYC) has become a common practice in digital banking services in Indonesia because it is considered efficient and facilitates the customer identity verification process without the need for physical presence. This technology helps banks accelerate account opening while fulfilling compliance obligations regarding the prevention of money laundering and terrorist financing(Srinadi, 2023).

The implementation of AI-based electronic Know Your Customer (e-KYC) in the Indonesian banking sector is primarily regulated by POJK No. 12/POJK.03/2021 on Personal Data Storage Service Providers and AI Governance in Indonesian Banking, which emphasizes the principles of governance, risk management, system security, personal data protection, and legal compliance. This regulation aligns with Law No. 8/1999 on Consumer Protection (UUPK), Law No. 27/2022 on Personal Data Protection (UU PDP), and Law No. 4/2023 on the Financial Services Authority (OJK), which grants the OJK the authority to regulate technological innovations in the financial sector(Indah Puspitasari et al., 2025).

However, the implementation of AI-based e-KYC raises a number of legal issues for consumers. Automated verification systems rely heavily on data quality and algorithm accuracy; thus, errors in facial or document recognition can lead to service

denial without adequate explanation. Consumers often do not know the reason for verification failure and lack sufficient avenues to file objections, potentially limiting access to financial services and creating legal uncertainty(Hani et al., 2025).

Furthermore, AI-based e-KYC involves the processing of highly sensitive personal data, particularly biometric data, thereby increasing the risk of data breaches and misuse if not managed carefully. Consumers' bargaining power in granting consent for data processing is also typically weak, as such consent is a prerequisite for accessing services. Furthermore, there is a potential for algorithmic bias in facial recognition systems that could have discriminatory effects on certain groups. Another issue is bias in facial recognition (low accuracy for Southeast Asian ethnic groups and women wearing headscarves), which potentially violates Article 4(g) of the UUPK (non-discrimination) and the principle of fairness in the OJK's AI Governance Framework(Maulani et al., 2025).

3. Biometric Authentication

Biometric authentication is used as a security method to access banking services via fingerprint, facial recognition, or voice recognition. The primary risk for consumers relates to the leakage and misuse of biometric data, which is highly sensitive and cannot be replaced like a password. In the event of a data breach, the impact is permanent and poses a high risk to consumer privacy(Noreen et al., 2023).

The main challenge lies in the highly sensitive nature of biometric data. According to Law No. 27 of 2022 on Personal Data Protection (PDP Law), biometric data is categorized as "special personal data" (Article 4(d)). Unlike passwords that can be changed, fingerprints or facial features are permanent and cannot be replaced if leaked. Therefore, banks, as data controllers, bear a very heavy responsibility(Yusriadi et al., 2023).

Violations of these obligations not only endanger customers but also expose banks to criminal penalties under Article 67 of the PDP Law, namely fines of up to Rp 6 billion or a maximum prison sentence of 6 years. The regulatory gap that arises is that while the Personal Data Protection Law (PDP Law) is robust, current banking sector regulations (POJK) lack detail in establishing specific technical standards for biometric data. For example, provisions regarding techniques for anonymizing identity within data, the obligation for annual security audits (penetration tests), and clear procedures for the deletion of biometric data after a customer closes an account have not been explicitly regulated. This gap may violate consumers' right to feel secure (Article 4(b) of the Consumer Protection Law) and could potentially lead to civil lawsuits under Article 1365 of the Civil Code regarding unlawful acts(Gresia & Regina Jansen Arsjah, 2024).

4. Chatbots or Virtual Assistants

The use of artificial intelligence (AI) technology in the form of chatbots and virtual assistants (such as VIRA at BCA, Sabrina at BRI, and MITA at Bank Mandiri) has become a trend in the Indonesian banking industry. This adoption is permitted by

regulation, primarily based on Financial Services Authority (OJK) Regulation No. 12/POJK.01/2021 on the Provision of Information Technology-Based Lending Services. This regulation serves as a gateway for digital innovation, including AI, with the primary aim of enhancing operational efficiency and providing 24/7 non-stop service to customers. Additionally, the OJK has issued the Guidelines on AI Governance for Indonesian Banking in April 2025 as a framework of principles to ensure the responsible implementation of AI(Widjaja & Legowo, 2024).

However, the implementation of these AI chatbots is not without serious legal risks, particularly regarding consumer protection. The primary risk is the phenomenon of "AI hallucination," where the system can generate information that sounds convincing but is actually incorrect or misleading. The accuracy rate of chatbots, often claimed to be around 80–90%, still leaves room for errors that can have fatal consequences, such as providing inappropriate financial product recommendations or incorrect procedural information. This behavior has the potential to violate Article 4(c) of Law No. 8 of 1999 on Consumer Protection (UUPK), which guarantees consumers' right to receive accurate, clear, and honest information. Furthermore, if an AI's automated decision causes harm to a customer, the bank is obligated to provide a clear explanation of that decision in accordance with Article 14 of Law No. 27 of 2022 on Personal Data Protection (UU PDP)(Mahdi et al., 2025).

The application of artificial intelligence in banking services in Indonesia has shifted from merely an operational support tool to an autonomous decision-making system that directly impacts consumers' fundamental rights, particularly through credit scoring, e-KYC, biometric authentication, and chatbots. These developments pose serious risks, including algorithmic discrimination, the "black box" phenomenon that hinders the right to accurate and clear information, the potential leakage of sensitive biometric data, and the risk of AI hallucinations that could mislead customers' financial decisions. These conditions highlight legal ambiguities, as current regulations still view technology as a static instrument, thereby failing to establish an adequate legal framework for liability regarding losses caused by automated systems. Without strengthened sectoral regulations that emphasize substantive transparency and effective oversight mechanisms, the use of AI in the banking sector risks further eroding the principles of procedural justice and legal certainty for consumers in Indonesia(Agustianto et al., 2025).

The Effectiveness of Regulations on Consumer Protection in the Use of AI in the Banking Sector

The digital transformation driven by the adoption of artificial intelligence (AI) has created a paradox in Indonesia's financial services sector. On the one hand, AI enhances the efficiency and innovation of banking services. On the other hand, this technology is also being exploited as a tool for increasingly complex digital financial crimes. The Financial Services Authority (OJK) has recorded over 38,000 public complaints related to digital financial crimes as of September 2025. This situation indicates that the acceleration of digitalization has not yet been fully balanced by adequate legal protection for consumers(Hani et al., 2025).

Although there is no specific law regulating AI in the banking and fintech sectors, the OJK and Bank Indonesia have established a policy framework through various regulations, such as OJK Regulation No. 22 of 2023 on Consumer and Public Protection, the OJK Regulation on Information Technology Risk Management, and Law No. 27 of 2022 on Personal Data Protection. In April 2025, the OJK also issued the Guidelines on AI Governance in the Indonesian Banking Sector, which emphasize the principles of accountability, transparency, algorithmic fairness, and human oversight(Agustiawan, 2024).

To assess the effectiveness of these regulations, this study employs Lawrence M. Friedman's Legal System Theory, which views law as a unified whole comprising three main elements: legal substance, legal structure, and legal culture. These three elements serve as parameters to evaluate the extent to which AI regulations in the banking sector can provide effective legal protection for financial services consumers.

1. Legal Substance

From the perspective of legal substance, regulations governing the use of AI in the Indonesian banking sector have not been formulated into a single specific regulation but are scattered across various legal instruments. OJK Regulation No. 22 of 2023 on Consumer and Public Protection has established the principles of fairness, transparency, and accountability in the use of digital technology, which are relevant to the application of AI in credit assessment, e-KYC, and other automated services. Law No. 27 of 2022 on Personal Data Protection provides a normative foundation for the processing of personal data and biometric data used in AI systems through the principles of lawful processing, purpose limitation, and data minimization(Melisa Melisa et al., 2025).

Additionally, OJK regulations on information technology risk management and the Indonesian Banking AI Governance Guidelines emphasize the importance of human oversight, system audits, and model risk controls. However, from Friedman's perspective, these legal provisions still exhibit limitations as they do not explicitly address the obligations of explainability, mitigation of algorithmic bias, and clarity regarding legal liability for consumer losses resulting from AI-based automated decisions(Agustianto et al., 2025).

2. Legal Framework

Within the legal framework, Friedman emphasizes the role of institutions, authorities, and enforcement mechanisms in implementing legal provisions. In the context of banking AI, the OJK plays a central role as regulator and supervisor, with support from Bank Indonesia and the Ministry of Communication and Information Technology in specific areas. Although the OJK has developed technology-based supervisory tools and issued AI governance guidelines, the existing legal framework still faces issues of fragmented authority and limited technical capacity(Saputra, 2024).

Supervision of AI use in banking tends to focus on administrative compliance and financial system stability, while the impact of algorithmic decisions on consumer

rights has not yet been a primary focus. Consumer complaint mechanisms also have not been specifically designed to assess losses arising from AI system errors, such as automatic credit rejections, e-KYC failures, or account blocking by fraud detection systems. This situation indicates that the legal framework is not yet fully adaptive to the risk characteristics of AI, as required by Friedman's theory for the law to function effectively(Jefry, 2025).

3. Legal Culture

The aspect of legal culture is a key element in Friedman's theory that determines whether the law is truly alive and enforced in practice. In the context of Indonesian banking, the institutional legal culture remains dominated by an orientation toward efficiency, innovation, and business interests, so that AI is viewed as an internal technical tool rather than a decision-making system with direct legal implications for consumers. Transparency regarding the use of AI, including the provision of explanations for automated decisions, remains relatively low(Suratno et al., 2024).

From the consumer's perspective, a legal culture has not yet fully taken shape. The public's legal and digital literacy regarding AI remains limited, so consumers tend to accept the banking system's decisions as objective and final. According to Friedman, the law will not be effective if the values it embodies are not internalized in the public consciousness. In line with Zarsky's perspective, without a legal culture that critically examines automated decisions, AI has the potential to reinforce structural inequalities through algorithmic biases that go unnoticed and unchallenged(Clara Ignatia Tobing et al., 2024).

As the use of AI in banking services increases, this technology not only brings benefits of efficiency and innovation but also gives rise to various potential legal risks for consumers. These risks arise due to AI's autonomous and complex nature, as well as its use in decision-making that directly impacts customers' rights. Therefore, to assess the extent to which consumer protection has been accommodated within the applicable legal framework, a risk analysis is required as an approach to identify and understand the forms of potential harm arising from the use of AI in the banking sector(Ikhsan et al., 2025), as follows:

Table 2. Risk Analysis of AI Implementation by Banks

Type of Risk	Form of AI Implementation	Legal Substance	Ineffectiveness
Transparency and Accountability Risk	Automated credit scoring and automatic credit denial	Right to information (Consumer Protection Law Article 4); Right to explanation of automated decisions (Personal	Norms are general in nature and do not regulate substantive standards for explaining AI decisions

		Data Protection Law Article 14)	
Discrimination Risk	Use of proxy variables in credit assessment	Principles of fairness and non-discrimination under Law No. 8 of 1999 on Consumer Protection	No explicit regulation regarding algorithmic bias audits and proxy variables
System Error and Accountability Risk	Algorithmic errors in creditworthiness assessment	Civil liability based on fault (Article 1365 of the Civil Code)	Difficult to apply to AI systems that are autonomous and self-learning
Personal Data Violation Risk	Processing of transaction data and biometric data	Personal data protection principles (Personal Data Protection Law)	No specific regulations on AI security and oversight in the banking sector
Regulatory Ineffectiveness Risk	Use of AI without specific technical standards (e.g., chatbots)	Financial Services Authority (OJK) regulations and AI governance guidelines	Dominance of soft law and absence of administrative and technical sanctions for AI

Based on Lawrence M. Friedman's legal system theory, the effectiveness of the Financial Services Authority's regulations in protecting consumers who use artificial intelligence in Indonesia's banking sector remains suboptimal due to weaknesses stemming from the interrelated aspects of legal substance, structure, and culture. At the substantive level, regulations remain fragmented and dominated by soft law instruments lacking binding sanctions, and have not yet anticipated the automatic and black-box nature of AI; consequently, obligations regarding algorithmic transparency, bias audits, and accountability for autonomous decisions have not been operationally regulated. These weaknesses are exacerbated by a legal structure where supervision remains focused on system stability and administrative compliance, compounded by fragmented authority and the absence of specialized technical units to investigate algorithmic errors. From a legal culture perspective, the banking sector still views AI solely as a tool for efficiency without internalizing accountability, while low digital literacy leaves consumers passive and accepting of automated decisions unconditionally. This situation indicates that without the synchronized strengthening of binding regulations, enhanced supervisory capacity, and systematic legal education, consumer protection regarding the use of AI will continue to lag behind the pace of banking innovation(Zuckerbrot, 2018).

CONCLUSION

Artificial Intelligence (AI) in various forms of banking services such as automated credit scoring, e-KYC, biometric authentication, and chatbots has become the backbone of digital transformation, enhancing service efficiency and personalization; however, the adoption of this technology has the potential to create real and specific legal risks for consumers. These risks include potential bias and lack of transparency in algorithmic decisions, vulnerabilities in the security of personal data particularly biometric data and inaccuracies in the information provided by automated systems. Furthermore, critical findings indicate that the dynamics and complexity of the risks associated with each AI implementation have not been matched by an adequate sectoral regulatory framework, thereby leaving gaps in legal protection for consumers regarding explanations of automated decisions, system quality standards, objection mechanisms, and specific technical data safeguards.

Based on an analysis using Lawrence M. Friedman's Legal System Theory, it can be concluded that the legal framework for AI governance in Indonesia's banking sector is not yet fully effective in ensuring consumer protection. This ineffectiveness stems from an imbalance among the three elements of the legal system. First, from the substantive legal perspective, existing regulations such as Law No. 27 of 2022 on Personal Data Protection (PDP Law), Law No. 8 of 1999 on Consumer Protection (UUPK), and OJK guidelines have established basic principles, but have not yet evolved into specific and comprehensive rules to address unique AI risks such as the obligation to provide explanations (explainability), mitigation of algorithmic bias, and clarity regarding legal liability for losses resulting from automated decisions. Second, regarding the legal framework, although the Financial Services Authority (OJK) has acted as the regulator, the institution's technical capacity and existing complaint mechanisms are not yet fully equipped to oversee the complexity of algorithms or handle consumer disputes specifically arising from AI system failures. Third, in the realm of legal culture, there is a significant gap in understanding where banks still view AI solely as a tool for business efficiency, while consumers are less aware of their rights and risks, thereby hindering the internalization of consumer protection values in everyday digital practices.

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