

Fintech adoption and zakat efficiency: The moderating role of Islamic bank performance

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Abstract

Fintech provides innovative solutions to improve the efficiency of zakat collection and distribution through digital payment systems, online applications, and blockchain technology. However, the effectiveness of fintech adoption may depend on the internal financial conditions of Islamic banks. This study examines the effect of fintech adoption on zakat efficiency and investigates the moderating role of bank financial performance in Indonesian Islamic banks. Using a quantitative approach with panel data from 12 Islamic Commercial Banks during the 2015–2024 period, fintech adoption is measured through a fintech adoption index derived from annual reports, while zakat efficiency is measured using the zakat distribution ratio. Financial performance is represented by Return on Assets (ROA) and Return on Equity (ROE). The findings reveal that fintech adoption does not directly affect zakat efficiency. However, ROA strengthens the relationship between fintech adoption and zakat efficiency, whereas ROE weakens it. These results indicate that the effectiveness of fintech in supporting Islamic banks' social functions depends more on efficient asset management than equity performance. This study highlights the importance of integrating digital transformation with sound financial management to optimize zakat management.

Keywords: Fintech, Islamic banks, zakat efficiency, return on assets, return on equity.

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Introduction

Digital transformation in the financial sector, especially with the emergence of fintech, has changed the way Islamic banks operate and manage their products and services (Aripin et al., 2022; Aysan et al., 2022; Sudarmanto et al., 2024) discussing the opportunities and challenges that arise with the adoption of digital technologies. The study utilizes a qualitative method with literature review approach. Digital transformation includes the implementation of innovations such as financial technology (fintech). Fintech offers advanced solutions, including digital payment platforms, mobile banking applications, and data management systems, that can improve operational efficiency and transparency (Budiman et al., 2020; Hidayat, 2023; Moro-Visconti & Cesaretti, 2023). In the context of zakat, fintech enables Islamic banks to collect and distribute zakat more efficiently and accurately (Ahmad & Yahaya, 2023; Ramadhani et al., 2021). This technology not only speeds up the transaction process but also enables better reporting and monitoring, which are essential for effectively fulfilling Sharia obligations (Amrullah & Hasan, 2021; Gani, 2023; Hassan et al., 2022).

However, the success of fintech adoption depends not only on the technology itself but also on the bank's internal conditions, including its financial performance (Kaddumi et al., 2023). Solid financial performance can provide a strong foundation for banks to invest in technology and make maximum use of it (Gomber et al., 2017; Vincent & Agustin, 2024; Yoon et al., 2023). Conversely, banks with less-than-optimal financial performance may face difficulties in implementing and maintaining the fintech technologies needed for zakat management (Marlina, 2020; Puschmann, 2017). Therefore, understanding how banks' financial performance affects the relationship between fintech adoption and zakat efficiency is an important aspect for identifying factors that can increase the effectiveness of technology in the context of Islamic finance (Baker et al., 2023; Melati, 2024; Widyandri & Laila, 2022).

In addition, although many Islamic banks in Indonesia have started implementing fintech (Afif & Samsuri, 2022; Amrullah & Hasan, 2021), the results achieved often vary (Fajria, 2019). Some banks report significant improvements in efficiency (Fajria, 2019), while others may face challenges integrating new technologies into existing processes (Hasni & Ardiansyah, 2022; Hassan et al., 2022). This variability suggests the existence of moderating factors that influence the outcomes of fintech adoption (Aditya & Rahmi, 2023; Belgacem et al., 2024). This study aims to identify and measure the role of financial performance as a moderating variable, providing deeper insight into how internal financial conditions can influence the success of fintech implementation in zakat management in Islamic banks in Indonesia.

Fintech has revolutionized various aspects of banking operations by offering innovative solutions for zakat collection and distribution, which are integral parts of the

Islamic financial system (Amrullah & Hasan, 2021; Hassan et al., 2022). In Indonesia, many Islamic banks have begun to integrate this technology to improve their business processes (Afif & Samsuri, 2022; Hasni & Ardiansyah, 2022; Unal & Aysan, 2022). However, although fintech promises many benefits, its effectiveness in the context of zakat can be influenced by other factors, especially the bank's financial performance (Kasri & Sosiati, 2023; Omar & Khairi, 2021). Good financial performance can provide banks with the resources needed to implement and utilize technology effectively (Kamaruddin et al., 2023), while poor financial performance may limit the potential for fintech adoption (Melati, 2024).

Previous studies (Alfarizi, 2022) have focused on fintech adoption in a broader context, without considering its specific impact on zakat collection and distribution within Islamic banks. In addition, research findings present contradictory evidence regarding the variability in the efficiency gains generated by Islamic banks through fintech adoption (Hassan et al., 2022; Kamaruddin et al., 2023; Putera & Nisa, 2024). The main gap is that many previous studies (Hasni & Ardiansyah, 2022; Vincent & Agustin, 2024) are limited to the relationship between fintech adoption and zakat efficiency in Islamic banks, but have not explored the moderating role of bank financial performance in the relationship between the two (Ahmad & Yahaya, 2023) attitude and trust (initial trust model. This study aims to fill this gap by investigating how bank financial performance can moderate the impact of fintech on zakat management efficiency. To ensure precision, this study defines fintech adoption using a keyword-based index, zakat efficiency using the distribution ratio, and performance using ROA and ROE. The systematic novelty lies in its dual-moderating framework; by decomposing financial performance into asset utilization (ROA) and equity return pressure (ROE), this study captures the strategic tension between the commercial logic and social mandates of Islamic banking.

Method

In this study, the adoption of fintech is expected to increase the efficiency of zakat collection and distribution by reducing transaction costs, accelerating the distribution process, and increasing transparency and accountability. However, the effectiveness of fintech adoption also depends on the internal conditions of Islamic banks, especially financial performance. Based on the resource-based view (RBV) theory, banks with better financial performance have stronger resources to implement technology effectively, so the impact of fintech on zakat efficiency may be greater than for banks with low financial performance. Therefore, banks' financial performance is expected to moderate the relationship between fintech adoption and zakat efficiency by strengthening or weakening fintech's impact on efficiency. The conceptual framework in this study is shown in Figure 1.

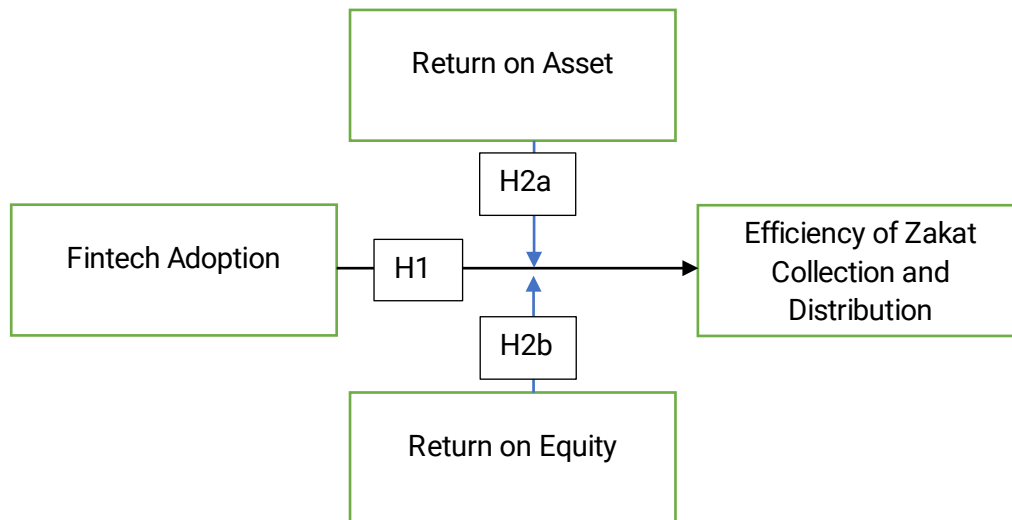


Figure 1. Theoretical Framework

Hypothesis Development

Based on the theory of innovation and diffusion, the adoption of fintech as a technological innovation in Islamic banks is expected to increase the efficiency of zakat collection and distribution (Amrullah & Hasan, 2021; Firmansyah et al., 2022). Innovation Diffusion Theory posits that the speed, integration, and structured adoption of digital systems allow an organization to eliminate informational asymmetry and reduce operational friction (Pamungkas et al., 2025). Fintech innovation allows banks to offer services that are faster, more transparent, and more widely accessible to the public (Rumanto, 2024; Saygili & Ercan, 2020). In addition, the theory of innovation and diffusion suggests that the faster an innovation is adopted by an organization, the greater the potential for increased operational efficiency (Abosede, 2020; Mulyana et al., 2024).

Previous studies have shown that the adoption of fintech, such as digital payment systems and online zakat applications, can significantly reduce transaction costs and processing time in zakat management (Amrullah & Hasan, 2021; Firmansyah et al., 2022). For example, research by Bank Indonesia (2021) shows that implementing fintech in zakat collection can increase community participation in zakat payments and accelerate the distribution of zakat to eligible recipients (Firmansyah et al., 2022; Rumanto, 2024). Therefore, the first hypothesis that can be developed is:

H₁: Fintech adoption positively impacts the efficiency of zakat collection and distribution in Indonesian Islamic banks.

The role of equity performance can be comprehensively examined through Agency Theory (Pandher et al., 2025). Agency Theory identifies potential conflicts of interest between managers (agents) and shareholders (principals). In agency theory, bank financial performance is a key indicator of management effectiveness in running bank

operations (Jensen & Meckling, 1976). Banks with good financial performance tend to have greater resources to adopt new technologies and manage risks associated with innovation (Gianni et al., 2021; Menicucci & Paolucci, 2023). High financial performance enables banks to invest more flexibly in technology, including fintech, which in turn can increase efficiency in zakat collection and distribution (Khoerunnisa et al., 2023; Otoo, 2024).

Previous studies have shown that banks with strong financial performance are more likely to successfully implement technological innovation (Sudarmanto et al., 2024) discussing the opportunities and challenges that arise with the adoption of digital technologies. The study utilizes a qualitative method with literature review approach. Digital transformation includes the implementation of innovations such as financial technology (fintech). The results of the study revealed that Islamic banks with high ROA and ROE were able to adopt more effective fintech, thereby positively impacting operational efficiency, including zakat management (Nurastuti & Rakhmat, 2024; Ubaidillah & Astuti, 2020). Thus, the second hypothesis that can be proposed is:

H_{2a}: Return on assets (ROA) moderates the effect of fintech adoption on the efficiency of zakat collection and distribution, such that better financial performance strengthens the positive effect of fintech on efficiency.

H_{2b}: Return on equity (ROE) moderates the effect of fintech adoption on the efficiency of zakat collection and distribution, such that better financial performance strengthens the positive effect of fintech on efficiency.

Variables

The independent variable is fintech innovation. Fintech innovation refers to the extent of financial technology use and integration by Islamic banks to improve operational efficiency and zakat management. This variable includes innovations in digital payment systems, online zakat applications, big data technology, and blockchain systems (Musana, 2023; Unal & Aysan, 2022). This variable is measured by the fintech adoption index, as reported in the study Kharrat et al. (2024). The fintech adoption index is calculated using keyword analysis of Islamic banks' annual reports. There are 10 keywords to search for in the annual report, including technology, digital banking, network, internet banking, online services, fintech, AI, blockchain, E-payment, and mobile banking.

The dependent variable is the efficiency of zakat collection and distribution. In this study, the variable of zakat collection and distribution efficiency refers to the extent to which Islamic banks are able to optimize the collection and distribution of zakat to recipients with minimal time and cost. The variable of zakat collection and distribution efficiency measures the bank's effectiveness in collecting and distributing zakat (Hadiyanto & Pusvisasari, 2022; Ismail & Masturah, 2014). This variable refers to the ratio

of zakat collected to zakat distributed (Bahri et al., 2020; Putera & Nisa, 2024; Wijaya et al., 2023). This variable is measured by the zakat distribution ratio (the amount of zakat distributed compared to the amount collected) (Bahri et al., 2020; Etika et al., 2024).

The moderating variable is bank financial performance. In this study, Islamic bank financial performance refers to the profitability of Islamic banks, reflecting their ability to manage assets and equity efficiently. Islamic bank financial performance measures the extent to which Islamic banks generate profits from their assets and equity (Majeed & Zainab, 2021; Ubaidillah & Astuti, 2020). The two main indicators used are ROA and ROE (Ash-Shiddiqy, 2019; Ledhem & Mekidiche, 2020) and (2. Return on Assets (ROA) measures the effectiveness of Islamic banks' use of assets in generating profits (Ledhem & Mekidiche, 2020). Return on Equity (ROE) measures the profitability of Islamic banks relative to shareholder equity (Ledhem & Mekidiche, 2020). ROE is measured by net profit divided by total equity (Rosmanidar et al., 2021).

Population and Sample

The research population includes all Islamic banks operating in Indonesia. The research sample comprises registered Islamic banks with complete and consistent data during the 2015-2024 research period. The sample was selected using a purposive sampling technique based on the following criteria: (1) Islamic banks must have complete fintech adoption and zakat management data, (2) Islamic banks must have annual reports available for the 2015-2024 period, and (3) Islamic banks must be active in operations during the research period. Based on these criteria, 12 Islamic Commercial Banks were selected as the final sample. With a research period spanning the panel data framework, this study utilizes 96 observations, providing an adequate and robust statistical foundation for panel data regression analysis.

Data Analysis

Data analysis was performed using EViews version 13. Panel data analysis was used to analyze cross-sectional data and data between objects simultaneously. The panel data regression model allows for dynamic evaluation of fintech adoption and zakat efficiency, as well as interactions with bank financial performance. The Chow test was used to determine whether there was a significant difference in the regression model across time groups (Nielsen & Whitby, 2015) we consider two generalisations, the one-step recursive Chow test (based on the sequence of studentised recursive residuals. The Chow Test helps in choosing between the Fixed Effects Model and the Random Effects Model (Upendra et al., 2023). The Hausman test was conducted to select between fixed-effects and random-effects models (Papadopoulos, 2023). The Hausman Test assesses the consistency of random-effects model estimates relative to the fixed-effects model and determines which model is more appropriate based on the test results (Le Gallo &

Sénégas, 2023). Hypothesis testing was conducted to test the main hypothesis, namely whether fintech adoption has a significant effect on the efficiency of zakat collection and distribution, and whether bank financial performance moderates the relationship.

Result and Discussion

The results of the Chow test show that the F-statistic value is 0.9371 with a probability of 0.5099, and the Chi-square value is 12.1197 with a probability of 0.3547 (Table 1). Both of these probability values are greater than the 5% significance level ($\alpha = 0.05$), so there is not enough evidence to reject the null hypothesis. Thus, it can be concluded that the Common Effect Model (CEM) is more appropriate to use compared to the Fixed Effect Model (FEM), because there is no significant difference between cross-sectional units. This means that the treatment of each Islamic bank in this model can be considered homogeneous, so there is no need to treat each bank specifically in the form of fixed effects.

Table 1. Chow test

Effects Test	Statistic	d.f.	Prob.
Cross-section F	0.937071	(11,80)	0.5099
Cross-section Chi-square	12.119705	11	0.3547

The results of the Hausman test show a Chi-square value of 10.3078 with a degree of freedom (df) of 8, and a probability value of 0.2441 (Table 2). This probability value is well above the 5% significance level ($\alpha = 0.05$), so there is insufficient evidence to reject the null hypothesis. Thus, it can be concluded that the Random Effect Model (REM) is more appropriate to use than the Fixed Effect Model (FEM). This means that the effects of differences between Islamic banks in this model are assumed to be random and uncorrelated with the independent variables, so the Random Effect Model approach is suitable for estimating the relationship between fintech adoption, zakat efficiency, and the moderating role of financial performance. Furthermore, these statistical diagnostic steps serve as a rigorous methodological robustness check, confirming that the baseline Common Effect Model yields stable, consistent, and highly reliable coefficients for the interaction effects across alternative panel specifications.

Table 2. Hausman test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	10.307786	8	0.2441

Hypothesis testing

Based on the results of hypothesis testing shown in Table 3, Fintech Innovation (IF) has a p-value of 0.2510, indicating it is not statistically significant at the 5% level. This result shows that fintech innovation has not had a strong enough influence on the efficiency of zakat distribution in this model. The interaction between ROA and fintech innovation shows a significant positive influence ($p = 0.0000$), indicating that ROA positively moderates the relationship between fintech and zakat distribution efficiency. Conversely, the interaction between ROE and Fintech Innovation is significant, with a p-value of 0.0000, indicating that ROE negatively moderates the relationship between fintech and zakat efficiency. For the control variables, bank size and FDR are insignificant, while OER (Operating Efficiency Ratio) has a significant negative effect ($p = 0.0055$). These results indicate that the higher the operational efficiency ratio (which means lower efficiency), the lower the efficiency of zakat distribution.

The results of the study also show that the F-statistic is 32.985 with a probability value of 0.0000, indicating that all independent variables have a significant effect on the dependent variable, namely the zakat distribution ratio (ZDR). The R-squared value of 0.7875 and the Adjusted R-squared of 0.7636 indicate that around 76% of the variation in the efficiency of zakat distribution is explained by the variables in the model, with the remainder attributable to other factors outside the model.

Table 3. Hypothesis Testing Results

Variables	t-Statistic	Prob.
C	1.6844	0.0956
Fintech Innovation (IF)	-1.1553	0.2510
Size	-0.6799	0.4983
OER	-2.8439	0.0055
FDR	1.0888	0.2792
ROA_IF	13.6074	0.0000
ROE_IF	-4.3762	0.0000
R-squared		0.7875
Adjusted R-squared		0.7636
F-statistic		32.9850
Prob(F-statistic)		0.0000

The Impact of Fintech Adoption on Zakat Efficiency

The results of the regression analysis using the Common Effect Model show that the fintech innovation variable does not significantly affect the efficiency of zakat collection and distribution in Indonesian Islamic banks. Although fintech is expected in theory to increase efficiency, these results indicate that these benefits have not been confirmed

in the context of zakat. This finding suggests that fintech adoption in Islamic banks may still be concentrated on commercial banking services rather than on strengthening social finance activities such as zakat management.

From a conceptual perspective, these results can be explained by the diffusion of innovation theory, which holds that technology adoption does not always lead to immediate performance improvements, especially if it has not been fully integrated into the operational process. In this context, fintech used by Islamic banks is likely still focused on commercial services, such as digital and mobile banking, and has not been optimally directed toward social functions, such as zakat management. In addition, aspects of organizational readiness and integrated sharia system support, as explained in the literature on Islamic financial system innovation, can be prerequisites for technology to be truly effective in increasing the efficiency of social services. This condition indicates that the effectiveness of fintech depends not only on technology adoption but also on institutional integration and managerial commitment toward Islamic social finance objectives.

This finding is in line with several previous studies. The results of this study are in line with Putera and Nisa (2024) who stated that although fintech provides the potential for operational efficiency, its utilization in the context of zakat is still constrained by the lack of data and process integration between Islamic financial institutions and zakat collection bodies. Likewise, Fajria (2019) revealed that the results of technology adoption in Indonesian Islamic banks vary greatly depending on institutional readiness and regulatory support. These findings indicate that the success of fintech implementation in Islamic social finance requires not only digital innovation but also institutional synergy and operational integration. Therefore, although fintech promises efficiency, these results indicate that in practice, Islamic banks have not succeeded in optimizing this technology to significantly improve the efficiency of zakat collection and distribution.

The Moderating Role of Return on Asset (ROA) on the Impact of Fintech on Zakat Efficiency

The estimation results show that the interaction between Return on Assets (ROA) and fintech adoption has a positive coefficient and is statistically significant ($p=0.0000$). This indicates that the financial performance of Islamic banks, as measured by ROA, strengthens the influence of fintech adoption on zakat efficiency, consistent with the hypothesis. Thus, the H2a hypothesis is strongly supported by empirical data. In this context, Islamic banks with high ROA tend to be better able to use technology effectively to increase efficiency in collecting and distribution.

Theoretically, this finding can be explained by the resource-based view (RBV) approach, which states that organizations with strong internal resources, including high profitability, are better able to adopt and manage technological innovation effectively (Liu

et al., 2025; Memon & Ooi, 2023) despite their several benefits, may have drawbacks, thus, they need a control mechanism or directional channel. Responsible innovation (RI). Within the RBV framework, sustainable performance and strategic goals are achieved when a firm effectively deploys its core capabilities as valuable and inimitable internal resources (Kamardi et al., 2025). High ROA reflects management's ability to use productive assets efficiently, so that when fintech is adopted, banks with strong internal efficiency will find it easier to integrate it into the zakat management system. In other words, ROA acts as an enabler in accelerating and strengthening the positive impact of digital innovation on the social services of Islamic banks (Nugraha et al., 2022).

This finding is in line with previous studies, Nurastuti and Rakhmat (2024) which showed that Islamic banks with strong financial performance are more effective in implementing digital innovation for socio-economic purposes. Khoerunnisa et al. (2023) also emphasized the importance of financial performance stability in supporting Islamic banks' digitalization strategy, especially in managing social functions such as zakat. Therefore, the results of this study strengthen the literature that places financial performance, especially ROA, as a key factor in the successful implementation of fintech in the context of inclusive and efficient Islamic finance.

The Moderating Role of Return on Equity (ROE) on the Impact of Fintech on Zakat Efficiency

Based on the results of a panel regression using the Common Effect Model, the interaction between Return on Equity (ROE) and fintech adoption (ROE_IF) has a negative coefficient with a significance level of 0.0000. This means that although statistically significant, the moderating effect of ROE runs counter to the hypothesized direction. In other words, ROE does not strengthen, but rather weakens, the effect of fintech adoption on the efficiency of zakat distribution. Thus, the H2b hypothesis is not supported by the data in this study. These results indicate that increasing ROE is not always aligned with the effectiveness of using fintech for social purposes, such as collecting and distributing zakat.

Conceptually, these results can be explained through agency theory, where management (agent) may focus more on maximizing shareholder (principal) profits than on the bank's social functions, such as zakat management. According to agency theory, agents face strong structural incentives to prioritize activities that maximize principals' wealth, thereby ensuring management security and performance bonuses (Linh, 2024). High ROE indicates the bank's orientation towards capital returns and, in practice, may reflect a preference for more financially profitable investments (Sitnicka et al., 2025). In this context, when fintech adoption is directed more toward increasing commercial profitability than social efficiency, the positive effect of fintech on zakat management may be reduced (Amri et al., 2024). The social function of Islamic banks may be marginalized

if the orientation towards shareholder returns is overly dominant (Cahya et al., 2025; Suharsono et al., 2026).

This finding is consistent with the studies of Kamaruddin et al. (2023) and Kasri and Sosianti (2023) which state that the success of utilizing fintech in supporting Islamic social finance, such as zakat, is highly dependent on the strategic orientation of bank management. Vincent and Agustin (2024) also revealed that most of the fintech implementations by Islamic banks in Indonesia focus more on efficiency and business expansion than on strengthening social services. Thus, the results of this study strengthen the argument that a high ROE is not necessarily aligned with the bank's commitment to social efficiency, especially in the context of zakat management.

Conclusion

This study aims to examine the effect of fintech adoption on the efficiency of zakat collection and distribution in Islamic banks in Indonesia, as well as the moderating role of Islamic bank financial performance as measured by Return on Assets (ROA) and Return on Equity (ROE). The estimation results with the Common Effect Model (CEM) show that fintech adoption has not had a significant direct effect on zakat efficiency. Meanwhile, the ROA and ROE variables, as indicators of bank financial performance, play different roles in moderating the relationship.

The interaction between fintech and ROA shows positive and significant results, indicating that ROA strengthens fintech's influence on zakat efficiency. Conversely, the interaction between fintech and ROE shows a significant negative effect, indicating that ROE weakens the relationship between fintech and zakat efficiency. Thus, only ROA has been shown to positively support the moderation hypothesis in the context of increasing the efficiency of zakat distribution through technological innovation. Empirically, the neutral direct effect of fintech contradicts the technological optimism of conventional banking, whereas the divergent moderating roles of ROA and ROE strongly align with Islamic economic literature on the strategic tension between institutional resource slack and shareholder wealth maximization pressures.

This study has several limitations that need to be considered. First, the data used is secondary and depends on the availability of information in Islamic banks' annual reports, so there is a possibility of information bias or limited data coverage that may not reflect the actual conditions of the entire zakat distribution process. Second, measuring the fintech index using keyword frequency in annual reports can capture quantitative aspects of technology adoption, but it has not directly measured the quality of its implementation. Third, this study focuses only on Islamic commercial banks and excludes Islamic business units or zakat institutions with *amil* status, so the results cannot be generalized to the entire technology-based zakat management ecosystem in Indonesia.

For Islamic bank management, the results of this study provide important insight: the adoption of fintech does not automatically increase the efficiency of zakat distribution unless supported by healthy internal bank conditions, especially efficient asset management (ROA). Therefore, management needs to ensure that the implemented digital transformation is truly integrated with the zakat management system and not solely focused on commercial services. In addition, the focus on increasing ROA through asset efficiency and productive investment should be the primary strategy for supporting the use of financial technology in the bank's social functions.

For regulators such as OJK and Bank Indonesia, these results show the need for incentive policies for Islamic banks that not only adopt fintech for public services, but also actively integrate it into the management of zakat and other Islamic social finance. The government can also encourage collaboration between Islamic banks and zakat institutions through a shared digital platform, so that technological innovation truly touches the social aspects of the Islamic financial system.

Further research is suggested to expand the observation period or deepen the approach through a mixed-methods design to explore implementation aspects, internal obstacles, and bank management's perceptions of implementing fintech for zakat. In addition, the inclusion of other variables, such as sharia governance or customer digital literacy, has the potential to enrich understanding of the dynamics of zakat efficiency in the digital era.

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