

Strategic management of digital transformation in Rural Banks: Evidence from Depok City in the open banking era

Prihatina Jati^{1*}, Meirna Milisani², Ahmad Firdaus³

Universitas Mitra Bangsa, Jakarta, Indonesia^{1,2,3}

jatitina15@gmail.com^{1*}, meirnamilisani@gmail.com², firdaus.ahmd3@gmail.com³



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Abstract

Purpose: This study aims to analyze the effects of technology infrastructure, security and regulatory compliance, and human resource readiness on the collaboration of Rural Banks (BPR) with fintech and the open banking ecosystem, with digital service adoption as a moderating variable.

Research Methodology: This research applied an associative quantitative method with a survey approach. Data were collected from 44 respondents representing 23 BPRs in Depok City. Respondents included executive officers, IT staff, and board members. The instrument used was a questionnaire distributed via Google Forms, and data analysis was performed using Partial Least Squares–Structural Equation Modeling (PLS-SEM) with SmartPLS 4 software.

Results: The findings show that human resource readiness has a significant positive effect on BPR–fintech collaboration. Technology infrastructure as well as security and regulatory compliance demonstrate no significant influence. Digital service adoption shows a positive but non-significant effect, although it moderates the negative influence of technology infrastructure. The research model obtained an R^2 value of 0.601, indicating a moderate explanatory power.

Conclusions: The study concludes that human resources are the most critical determinant of successful BPR digital transformation and collaboration with fintech. Technical and regulatory factors contribute positively but insignificantly, while digital service adoption primarily plays a moderating role.

Limitations: This study is limited to BPRs in Depok City with a relatively small sample size. Thus, the findings may not be generalizable to other regions or banking institutions.

Contribution: This study contributes to the literature on financial digitalization by highlighting the central role of human resource readiness in fintech collaboration. Practically, it offers insights for BPR management, regulators, and policymakers in designing strategies to strengthen HR competence and digital adoption in the context of open banking.

Keywords: *Digitalization, Digital Financial Innovation, Financial Services Transformation, Open Banking, Rural Banks (BPR)*

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1. Introduction

The rapid advancement of digital technology has fundamentally reshaped the financial services industry, particularly through the emergence of financial technology (fintech) and the implementation

of open banking systems. By utilizing Application Programming Interfaces (APIs), open banking enables integration between banks and third-party providers, fostering transparency, innovation, and competitiveness in the financial ecosystem (Arner, Barberis, & Buckley, 2015).

Rural Banks (BPR) in Indonesia face unique challenges in this transformation. Unlike commercial banks, BPRs operate on a smaller scale, serving micro, small, and medium enterprises (MSMEs) and underbanked communities, yet with limited technological and financial capacity (Malihah, Sundhusiah, Ramadani, & Astuti, 2024). In Depok City, there are 28 BPRs under the Perbarindo Commission, competing not only with commercial banks but also with fintech-based financial applications such as e-wallets. Digitalization is expected to enhance efficiency, expand service outreach, and improve the customer experience. However, preliminary studies have shown that BPRs still face obstacles in technology infrastructure, compliance with digital regulations, and human resource readiness to adopt digital systems (Bustani, 2025).

Prior research underscores the importance of digitalization in banking. Haddad and Hornuf (2019) found that fintech adoption depends heavily on technological and regulatory preparedness. Similarly, Siburian, Guguk, Surbakti, and Harahap (2024) highlighted the significant value of fintech innovations for adaptable institutions. However, most of these studies have focused on commercial banks Gomber, Kauffman, Parker, and Weber (2018); Lee and Shin (2018), while research on BPR digitalization remains limited. This gap is significant given that BPRs play a strategic role in supporting financial inclusion at the grassroots level (Ozili, 2018).

This study aims to bridge this research gap by examining how BPRs adapt to digitalization and collaborate with fintech under the open banking framework. Unlike previous studies, it integrates multiple factors—technology infrastructure, regulatory compliance, human resource readiness, and digital service adoption—into a comprehensive analytical model. Furthermore, it explores the moderating role of digital adoption, which may strengthen or weaken the relationship between internal capacity and external collaboration (Thakor, 2020). Accordingly, this study aims to provide empirical evidence on the determinants of BPR collaboration with fintech in Depok City, thereby contributing to both theoretical enrichment in the literature on digital transformation and practical strategies for strengthening financial inclusion through rural banks.

2. Literature review and hypothesis development

The rapid development of financial technology (fintech) and open banking has significantly transformed the financial services sector in recent years. Fintech adoption has redefined how banking services are delivered by improving efficiency, expanding financial inclusivity, and intensifying competition among institutions (Arner et al., 2015; Gomber et al., 2018). Efficiency gains are achieved through process automation, faster transactions, and lower operational costs, which enable banks to serve customers more effectively. Financial inclusivity is enhanced as fintech solutions provide easier access to banking services for unbanked and underserved populations. Simultaneously, competition grows as fintech startups introduce innovative products and services that challenge traditional banking models, prompting incumbent banks to adapt and innovate.

Open banking, facilitated by Application Programming Interfaces (APIs), is recognized as a disruptive innovation that encourages banks to collaborate with third-party providers and rethink their technology strategies (Nathania, Abubakar, & Handayani, 2023). By enabling secure data sharing, open banking promotes the co-creation of financial products and fosters an ecosystem in which banks, fintechs, and other stakeholders deliver greater value to customers. This paradigm shift requires banks to enhance their technology readiness, strengthen cybersecurity, and adopt customer-centric approaches to remain competitive in a rapidly evolving market.

Despite extensive research on fintech and open banking, most studies have focused on large commercial banks, leaving limited attention to smaller institutions, particularly Rural Banks (Bank Perkreditan Rakyat, BPRs). BPRs play a crucial role in local economic development by serving small-scale borrowers and promoting financial inclusion in under-served communities. However, their limited size

and resources present challenges in adopting digital technologies, including constraints in IT infrastructure, human capital, and regulatory compliance issues. These challenges affect the pace and effectiveness of digital transformation within BPRs, making it critical to understand their experiences and strategies.

Examining digital transformation among BPRs is essential to identify how these institutions leverage fintech and open banking opportunities while overcoming their limitations. Insights into organizational readiness, leadership, and collaboration with third-party providers can inform strategies for the successful adoption of technology. Additionally, research on BPRs can guide policymakers in supporting the modernization of small-scale banks to ensure financial stability and expand access to banking services. Understanding these dynamics contributes to creating a more inclusive, efficient, and resilient banking ecosystem that benefits local communities and the broader economy.

In conclusion, while fintech and open banking have been widely studied in the context of large commercial banks, the digital transformation of smaller institutions, such as BPRs, remains underexplored. Given the vital role of BPRs in promoting financial inclusion in Indonesia, investigating their adaptation to fintech and open banking is crucial (Arner et al., 2015; Gomber et al., 2018). Addressing this research gap provides valuable insights for practitioners and policymakers, supporting the development of a more technologically advanced and inclusive financial services sector.

2.1. Technology Infrastructure

Technology infrastructure serves as the foundation for digitalization by providing reliable systems, networks, and tools that are necessary to support financial innovations. A robust IT infrastructure enables organizations to adopt and implement fintech solutions effectively, enhancing operational efficiency, service quality, and overall readiness for digital transformation (Alt, Beck, & Smits, 2018; Gomber, Koch, & Siering, 2017). Strong infrastructure ensures that banking processes run smoothly, data are securely managed, and financial services can be scaled to meet increasing customer demands. Conversely, inadequate infrastructure can hinder digital adoption, limit scalability, and reduce the quality of service delivery, posing significant challenges for financial institutions seeking to remain competitive in a rapidly evolving market (Puschmann, 2017).

Evidence from international contexts underscores the importance of technological readiness. A study in China demonstrated that the growth of digital finance was closely linked to advancements in banking IT systems, highlighting the role of infrastructure in supporting financial innovation (Guo et al., 2020). In Indonesia, similar challenges have been observed, particularly among Rural Banks (BPRs), where poor infrastructure has been identified as a critical barrier to competitiveness and effective service delivery (Mudassir & Natsir, 2025). These findings suggest that investment in IT infrastructure is essential for enabling fintech adoption, promoting efficiency, and strengthening the digital capabilities of banks, especially smaller institutions like BPRs

H1: Technology infrastructure positively affects BPR–fintech collaboration.

2.2. Security and Regulatory Compliance

Security and regulations are among the most critical determinants of fintech adoption. Effective regulatory frameworks provide consumer protection, enhance transparency, and build trust in digital financial ecosystems, which are essential for fostering fintech adoption and collaboration (Lee & Shin, 2018). Conversely, regulatory gaps and ambiguities can slow innovation, particularly in emerging markets, where inconsistent or underdeveloped rules create uncertainty for banks and fintech providers (Haddad & Hornuf, 2019). Cybersecurity risks further influence adoption, as weak data protection and exposure to digital threats reduce consumer confidence in online banking and financial services (Gai, Qiu, & Sun, 2018).

Studies have shown that robust security measures and clear regulatory guidance encourage banks to engage more confidently with fintech partners, facilitating the co-creation of innovative services. Evidence from the European Union indicates that regulatory clarity accelerates fintech collaboration and integration, whereas uncertainty and a lack of standardization hinder progress and limit the adoption

of new digital solutions (Zetsche, Buckley, Barberis, & Arner, 2017). In the context of Indonesian Rural Banks (BPRs), these factors are particularly relevant, as adherence to security protocols and regulatory compliance can significantly influence the success of BPR–fintech collaboration. Therefore, security and regulatory compliance are expected to positively affect collaborative initiatives between BPRs and fintech providers

H2: Security and regulatory compliance positively affect BPR–fintech collaboration.

2.3. Human Resource Readiness

Human resources play a central role in the digital transformation of financial institutions (FIs). Employee digital competence, organizational culture, and adaptability are key drivers of successful fintech adoption, as they determine how effectively new technologies are implemented and integrated into daily operations (Vives, 2017). In the Indonesian context, Rural Banks (BPRs) face significant challenges in building human resource readiness, particularly regarding technical skills, digital literacy, and the ability to adapt to evolving technological demands (Irna & Mahmud, 2024). Research indicates that employees' adaptability is strongly correlated with organizational resilience during digital transitions, enabling banks to respond flexibly to changes in customer needs and technological innovations (Demirgüç-Kunt, Klapper, Singer, & Ansar, 2022).

Insufficient HR development can undermine digital transformation efforts, as investments in technology may fail to deliver effective digital services without a workforce capable of leveraging these tools (Syahfitri, Husna, Kristina, & Azhizah, 2025). Therefore, developing employees' skills, fostering a supportive organizational culture, and promoting continuous learning are crucial strategies for enhancing digital readiness. In particular, for BPRs aiming to collaborate with fintech providers, human resource readiness is expected to play a significant role in the success of these partnerships.

H3: Human resource readiness has a positive effect on BPR–fintech collaboration.

2.4. Digital Service Adoption

Digital service adoption is a critical component of financial digitalization, functioning as an outcome of organizational readiness and a driver of further technological development. Prior studies indicate that the adoption of digital services is influenced by multiple factors, including technological infrastructure, regulatory frameworks, and human resource readiness. Robust infrastructure enables banks to implement digital services efficiently, and clear regulations and competent human resources ensure that adoption is sustainable and secure. A global survey highlighted that rising consumer expectations for real-time and seamless financial services accelerated the adoption of digital solutions, compelling financial institutions to innovate and modernize their service offerings (Thakor, 2020).

Furthermore, the adoption of digital services not only improves operational efficiency but also enhances competitiveness by facilitating deeper collaboration with fintech partners, promoting the co-creation of innovative products, and expanding market reach (Frost, 2020). However, in emerging markets such as Indonesia, adoption remains uneven, particularly among Rural Banks (BPRs), owing to constraints in financial, technological, and human resources. Limited infrastructure, insufficient IT skills, and a lack of regulatory guidance often hinder the full integration of digital services within these institutions. Addressing these challenges requires a coordinated approach that combines investment in technology, strengthening regulatory compliance, and capacity building for employees. By improving these areas, BPRs can enhance their readiness to adopt digital services, strengthen their collaboration with fintech providers, and ultimately contribute to broader financial inclusion initiatives across Indonesia.

H4: Digital service adoption positively affects BPR–fintech collaboration.

2.5. Moderating Role of Digital Service Adoption

Several scholars argue that digital service adoption may play a moderating role in enhancing the effectiveness of internal organizational capabilities on collaboration outcomes. In particular, technological infrastructure, regulatory compliance, and human resource readiness are considered critical internal capabilities that influence how financial institutions engage with external partners, such as fintech providers. Research suggests that the adoption of digital services can strengthen the impact of technology infrastructure on external partnerships by ensuring that technological investments are

translated into practical, scalable solutions (Alt et al., 2018; Gomber et al., 2018). Well-adopted digital services facilitate seamless data sharing, operational efficiency, and innovative service delivery, which in turn enhance the institution's attractiveness and reliability as a collaboration partner.

Similarly, digital service adoption may help mitigate the negative effects of weaker regulatory frameworks and limited human resource capacity. For instance, when regulatory guidance is ambiguous or incomplete, well-implemented digital services can provide standardized and secure procedures that maintain consumer trust and support compliance (Gayo & Ilham, 2024). Institutions with limited HR capacity can leverage digital services to automate routine tasks, enhance service quality, and compensate for gaps in technical expertise. These mechanisms suggest that digital adoption not only acts as an outcome of internal readiness but also amplifies the effectiveness of organizational capabilities in promoting successful collaboration.

H5: Digital service adoption moderates the effect of technology infrastructure on BPR–fintech collaboration.

H6: Digital service adoption moderates the effect of security and regulatory compliance on BPR–FinTech collaboration.

H7: Digital service adoption moderates the effect of human resource readiness on BPR–FinTech collaboration.

3. Methodology

This study employed a quantitative survey-based approach with an associative research design to examine the relationships between key organizational capabilities and the collaboration of Rural Banks (BPRs) with fintech providers in Depok City. An associative design was chosen because it allows for testing the strength and direction of relationships among variables rather than merely describing phenomena, thereby providing insights into potential causal or correlational patterns. This study specifically focused on four independent variables: technology infrastructure, security and regulatory compliance, human resource readiness, and digital service adoption. The dependent variable was the level of collaboration between the BPRs and fintech providers.

Data were collected through structured questionnaires distributed to the management and operational staff of BPRs who are directly involved in digital banking operations and fintech collaborations. The survey instruments were developed based on validated scales from previous studies to ensure the reliability and validity of the measurements (Alt et al., 2018; Lee & Shin, 2018; Vives, 2017). Respondents were asked to assess their organization's technological capabilities, adherence to security and regulatory standards, preparedness of human resources, extent of digital service adoption, and effectiveness of collaboration with fintech partners.

The collected data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM), which is appropriate for examining complex models with multiple constructs and relationships, including both direct and indirect effects. This method allows researchers to evaluate the influence of internal organizational capabilities and digital service adoption on collaboration outcomes. Thus, this study provides a comprehensive understanding of how BPRs can leverage their internal resources and technology adoption to foster successful partnerships with fintech providers. The results are expected to offer both theoretical and practical implications, guiding BPRs in strengthening fintech collaborations and promoting financial inclusion within the local community of Depok City.

3.1. Research Setting and Participants

The study was conducted among 23 Rural Banks (BPRs) registered under the Perbarindo Commission in Depok, Indonesia. The population included executives, IT staff, and board members responsible for strategic planning and digital initiatives, ensuring that the respondents had relevant knowledge of BPR digital transformation. Using purposive sampling, 44 valid responses were collected that met the criteria for inclusion and provided reliable data for analysis. This method ensured that the participants were directly involved in technology adoption, regulatory compliance, human resource development and fintech collaboration.

The survey was distributed electronically via Google Forms between March and July 2025, allowing for efficient and secure data collection while accommodating the participants' schedules. The responses captured the perceptions and experiences of individuals managing digital services and organizational capabilities, offering a robust foundation for examining the relationships between technology infrastructure, security and regulatory compliance, human resource readiness, digital service adoption, and BPR–FinTech collaboration.

3.2. Research Instrument

A structured questionnaire was developed based on prior studies on digital finance and open banking Gomber et al. (2018); Haddad and Hornuf (2019); Lee and Shin (2018) to measure the key constructs relevant to BPR–fintech collaborations. The questionnaire consisted of closed-ended items, each measured on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The survey included five constructs, each with five items: (1) Technology Infrastructure, (2) Security and Regulatory Compliance, (3) Human Resource Readiness, (4) Digital Service Adoption, and (5) BPR–Fintech Collaboration.

Instrument validity was ensured through content validity, verified by expert judgment, and construct validity, assessed using convergent and discriminant validity via partial least squares structural equation modeling. Reliability was evaluated using Cronbach's Alpha and Composite Reliability, with thresholds set above 0.7 to confirm internal consistency. By applying these rigorous validity and reliability assessments, the questionnaire provided a robust and reliable tool for capturing respondents' perceptions and experiences regarding organizational capabilities, digital adoption, and collaboration outcomes in the context of small-scale banks in Indonesia.

3.3. Research Procedure

Before the main survey, a pilot test was conducted with five respondents from the target population to ensure the questionnaire's clarity, relevance, and reliability. The pilot study aimed to identify ambiguous items, verify that the questions accurately measured the intended constructs, and confirm that the response scales were understandable. Feedback from the pilot led to minor revisions in wording and formatting, improving the overall clarity and comprehensibility of the surveys. After these adjustments, the final questionnaire was distributed to the full sample size. It was designed to collect data on key variables, including technology infrastructure, security and regulatory compliance, human resource readiness, digital service adoption, and BPR–Fintech collaboration. Each construct was measured using multiple items on a Likert scale to comprehensively capture the respondents' perceptions and experiences.

Ethical considerations were strictly adhered to throughout the research process. Participation was voluntary, and the respondents were informed of their right to withdraw at any time. Anonymity was ensured by not collecting personal identifiers, and the confidentiality of responses was guaranteed, with all data stored securely and used solely for research purposes. These measures promoted honest and unbiased responses, thereby enhancing the reliability and validity of the data. By conducting a pilot test and adhering to ethical standards, this study ensured that the survey instrument was both robust and ethically sound, providing a solid foundation for subsequent quantitative analysis.

3.4. Data Analysis

The collected data were analyzed using Partial Least Squares structural equation modeling (PLS-SEM) with SmartPLS 4.0 software (SmartPLS GmbH, Germany). PLS-SEM was selected as the analytical method because of its suitability for exploratory research, handling small to medium sample sizes, and accommodating complex models that include moderating variables (Hair Jr, Hult, Ringle, & Sarstedt, 2017). This method allows researchers to simultaneously assess measurement models and structural relationships, providing robust results even when the normality assumptions are not strictly met.

Prior to hypothesis testing, several assumptions were verified to ensure the model's validity and reliability. Multicollinearity among the predictor variables was assessed to avoid redundancy and inflated standard errors. Convergent validity was examined using the Average Variance Extracted

(AVE), with a threshold value greater than 0.5 indicating that the constructs adequately explained the variance of their indicators. Discriminant validity was evaluated using the Fornell–Larcker criterion to confirm that each construct was distinct from the others in the model.

Hypothesis testing was conducted using the bootstrapping procedure with 5,000 resamples, which provided t-values and confidence intervals for evaluating the significance of the path coefficients. This approach ensures a rigorous assessment of the direct, indirect, and moderating effects among the constructs. By applying PLS-SEM with these procedures, the study generated reliable and valid results, offering insights into the relationships between technology infrastructure, security and regulatory compliance, human resource readiness, digital service adoption, and BPR–fintech collaboration

3.5. Research Assumptions and Conditions

This study ensured that respondents had a clear understanding of the digitalization processes within their respective Rural Banks (BPRs), which is crucial for obtaining accurate and informed survey responses. The survey assumed stable Internet connectivity to facilitate electronic distribution and completion, minimizing disruptions during data collection. Data were analyzed under the assumption of linear and causal relationships between variables, following systems theory in organizational research, which emphasizes the interconnections among components within complex organizations.

This approach supports understanding how internal capabilities, including technology infrastructure, security and regulatory compliance, human resource readiness, and digital service adoption influence BPR–fintech collaboration outcomes. By clearly presenting the survey instruments, purposive sampling methods, and analytical procedures using PLS-SEM, this study ensures transparency, reliability, and replicability. These measures provide a robust framework that can be applied in similar BPR contexts across Indonesia, offering insights for both academic research and practical strategies to enhance digital transformation and FinTech partnerships in small-scale banking institutions.

4. Results and discussions

4.1. Descriptive Statistics

The survey involved 44 respondents from 23 Rural Banks (BPRs) in Depok City. The data were categorized into organizational characteristics and demographic factors. These findings align with Ozili (2018); Vives (2017), who emphasized the centrality of HR in fintech adoption.

Table 1. Characteristics of Respondents (Organizational)

BPR Age	N	%
< 5 Years	1	4.35
6 – 10 Years	1	4.35
11 – 15 Years	1	4.35
16 – 20 Years	1	4.35
> 20 Years	19	82.60
Total	23	100

Source: Survey data processed (2025)

Table 2. Characteristics of Respondents (Demographic Factors)

Demographic Factors	Category	N	%
Gender	Male	14	31.82
	Female	30	68.18
	Total	44	100
Position	IT Staff	16	36.36
	Executive Officer	20	45.45
	BPR Management (Director/Board)	8	18.19
	Total	44	100

Length of Service	< 3 Years	18	40.91
	3 – 6 Years	5	11.36
	> 6 Years	21	47.73
	Total	44	100
Educational Background	Vocational / Senior High School	3	6.82
	Diploma (D1–D3)	8	18.18
	Bachelor	31	70.46
	Postgraduate	2	4.54
	Total	44	100

Source: Survey data processed (2025)

4.2. Measurement Model (Outer Model)

The measurement model was evaluated using reliability and validity tests with **SmartPLS 4**.

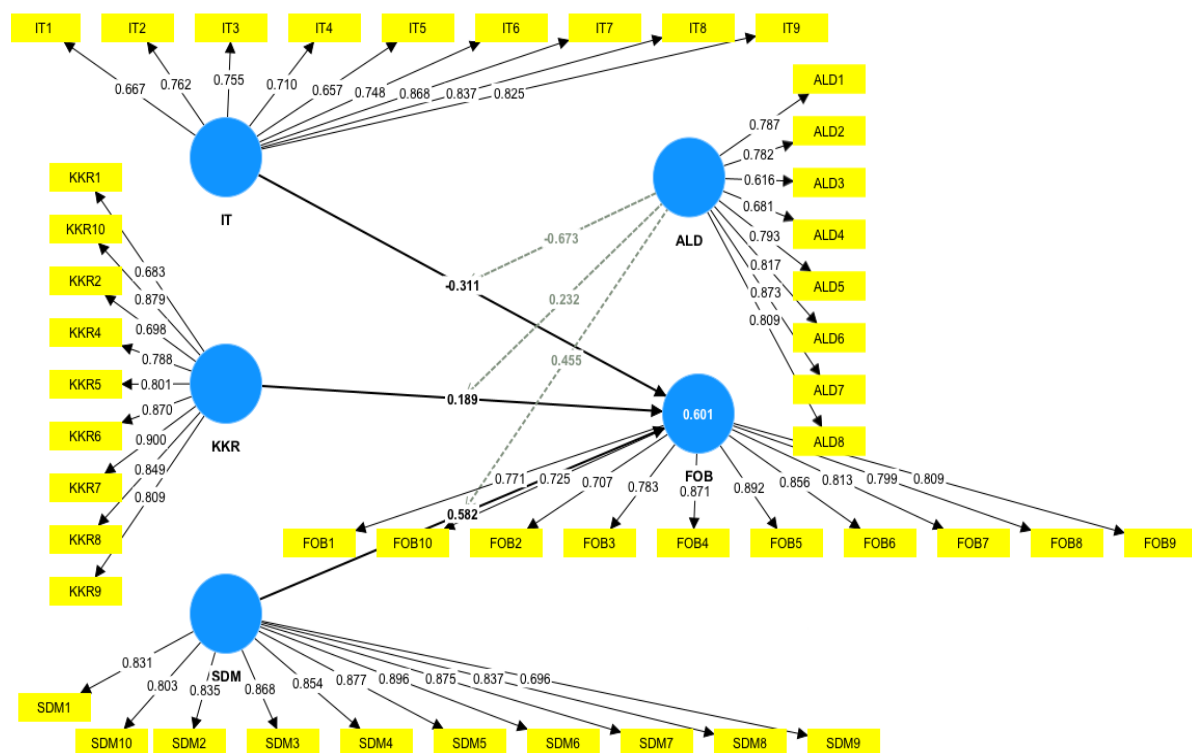


Figure 1. Outer Loading Test

The results of the reliability and validity tests are shown in Table 3. All constructs showed Cronbach's alpha values above 0.90, indicating excellent internal consistency and suggesting that the survey items reliably measured the intended constructs. Composite Reliability, assessed using both ρ_a and ρ_c , exceeded the recommended minimum threshold of 0.70, further confirming the reliability of the measurement model (Hair Jr et al., 2017). In addition to reliability, convergent validity was evaluated using the Average Variance Extracted (AVE), with all constructs reporting values above 0.50. These AVE values indicate that the constructs adequately explain the variance of their respective indicators, satisfying the criteria for convergent validity (Fornell & Larcker, 1981). Collectively, these results demonstrate that the measurement model is both reliable and valid, providing a strong foundation for subsequent structural analysis and hypothesis testing in examining the relationships between technology infrastructure, security and regulatory compliance, human resource readiness, digital service adoption, and BPR–fintech collaboration.

Table 3. Construct Reliability and Validity

Construct	Cronbach's Alpha	Composite Reliability (rho_a)	Composite Reliability (rho_c)	Average Variance Extracted (AVE)
ALD	0.902	0.911	0.922	0.598
FOB	0.939	0.945	0.948	0.647
IT	0.909	0.923	0.925	0.581
KKR	0.934	0.942	0.945	0.659
SDM	0.953	0.963	0.959	0.704

Source: Data processed using SmartPLS 4 (2025)

These results confirm that the measurement model satisfies the criteria for reliability and convergent validity. Cronbach's Alpha, Composite Reliability, and AVE values all met the recommended thresholds, ensuring that the constructs were measured consistently and accurately. Therefore, the structural model can be confidently analyzed for hypothesis testing and relationship assessments.

4.3. Structural Model (Inner Model)

The structural model was evaluated using the coefficient of determination (R^2), effect size (f^2), and Goodness of Fit (GoF) index to assess its explanatory and predictive capabilities. The R^2 value for BPR–Fintech Collaboration (FOB) is 0.601, indicating that 60.1% of the variance in collaboration is explained by the combined effects of technology infrastructure (IT), security and regulatory compliance (KKR), human resource readiness (SDM), and digital service adoption (ALD). According to Chin (1998), this represents a moderate level of explanatory power, suggesting that the model sufficiently captures the main factors influencing collaboration outcomes.

Effect size (f^2) analysis revealed that human resource readiness (SDM) had the strongest contribution to BPR–fintech collaboration, with a value of 0.164. Digital service adoption (ALD) showed a moderate effect of 0.097, whereas technology infrastructure (IT = 0.037) and security and regulation (KKR = 0.011) exerted weak effects, indicating varying levels of influence among the predictors. The Goodness of Fit (GoF) index was calculated using the formula proposed by Tenenhaus, Vinzi, Chatelin, and Lauro (2005), providing an overall measure of model fit by integrating both the quality of the measurement model and the explanatory power of the structural model. This ensures that the model is both statistically robust and theoretically meaningful for analyzing BPR–fintech collaborations.

$$\begin{aligned} \text{GoF} &= \sqrt{\text{AVE} \times R^2} \\ &= \sqrt{0.638 \times 0.601} = \sqrt{0.3833178} = 0.619 \end{aligned}$$

This value (> 0.36) indicates a large GoF, confirming that the model has strong explanatory and predictive power.

Table 4. Structural Model Results (R^2 , f^2 , GoF)

Construct	R^2	f^2	GoF	Interpretation
IT	–	0.037	–	Weak effect
KKR	–	0.011	–	Weak effect
SDM	–	0.164	–	Strong effect
ALD	–	0.097	–	Moderate effect
FOB	0.601	–	0.619	Moderate R^2 , Large GoF

Source: Data processed using SmartPLS 4 (2025)

These findings indicate that human resource readiness (SDM) is the most significant predictor of BPR–fintech collaboration. With an overall Goodness of Fit (GoF) value of 0.619, the results provide strong evidence that the proposed structural model demonstrates both a good fit and substantial explanatory power for understanding collaboration outcomes.

4.4. Hypothesis Testing

Hypothesis testing was performed using the bootstrapping method with 5,000 resamples in SmartPLS 4, applying a 5% significance level ($p < 0.05$). The results, summarized in Table 5, show the significance of each proposed relationship, providing empirical support for evaluating the effects of technology, HR, security, and digital adoption on BPR–fintech collaboration.

Table 5. Hypothesis Testing Results

Hypothesis	Path Description	Original Sample (O)	Sample Mean (M)	STDEV	T Statistics	P Values	Result
H1	Adoption of Digital Services (ALD) → BPR–Fintech Collaboration (FOB)	0.385	0.436	0.242	1.593	0.112	Not Supported
H2	Technology Infrastructure (IT) → BPR–Fintech Collaboration (FOB)	-0.311	-0.304	0.306	1.016	0.310	Not Supported
H3	Security & Regulatory Compliance (KKR) → BPR–Fintech Collaboration (FOB)	0.189	0.138	0.330	0.572	0.567	Not Supported
H4	Human Resource Readiness (SDM) → BPR–Fintech Collaboration (FOB)	0.582	0.574	0.266	2.186	0.029	Supported
H5	Adoption of Digital Services (ALD) × Technology Infrastructure (IT) → BPR–Fintech Collaboration (FOB)	-0.673	-0.543	0.342	1.968	0.050	Supported (Marginal)
H6	Adoption of Digital Services (ALD) × Security & Regulatory Compliance (KKR) → BPR–Fintech Collaboration (FOB)	0.232	0.177	0.507	0.458	0.647	Not Supported
H7	Adoption of Digital Services (ALD) × Human Resource Readiness (SDM) → BPR–Fintech Collaboration (FOB)	0.455	0.397	0.391	1.162	0.246	Not Supported

Source: Data processed using SmartPLS 4 (2025)

The hypothesis testing results are summarized as follows:

1. **H4 (SDM → FOB)** is supported ($\beta = 0.582$, $p = 0.029$), confirming that human resource readiness significantly and positively improves BPR–fintech collaboration.
2. **H5 (ALD × IT → FOB)** is marginally significant ($\beta = -0.673$, $p = 0.050$), indicating that digital service adoption moderates the relationship between technology infrastructure and collaboration.
3. Other hypotheses (**H1, H2, H3, H6, and H7**) were not supported, suggesting that technology infrastructure, security and regulation, and digital adoption alone are insufficient to enhance collaboration without strong human resource capacity.

These results emphasize the critical role of human resources in facilitating effective partnerships between BPRs and FinTech providers. These findings reinforce earlier studies emphasizing the centrality of human resources in driving digital transformation within financial institutions, particularly small-scale banks (Ozili, 2018; Vives, 2017). Human resource readiness, including digital skills, adaptability, and organizational support, is a critical determinant of successful collaboration with fintech providers. Conversely, the results highlight the limited role of technology infrastructure and regulatory compliance when implemented in isolation, suggesting that without strong human resource capacity, investments in infrastructure or adherence to regulations alone may not effectively enhance collaboration (Abdurrahman, Gustomo, & Prasetyo, 2024). This underscores the importance of developing and empowering staff to maximize the outcomes of digital transformation in BPRs.

4.5. Discussion

The results of this study provide important insights into the digital transformation of Rural Banks (BPRs) in Depok City. The findings highlight that human resource readiness (SDM) is the most significant determinant of BPR–fintech collaboration ($\beta = 0.582$, $p = 0.029$). This result is consistent with earlier research emphasizing the centrality of human capacity in driving digital transformation (Ozili, 2018; Vives, 2017). BPRs with employees who possess adequate digital skills and adaptability are more capable of building effective collaborations with fintech, ensuring smoother integration and service innovation (Bustani, 2025).

Meanwhile, technology infrastructure (IT) and security & regulatory compliance (KKR) were found to be statistically insignificant predictors. Although prior studies Alt et al. (2018); Haddad and Hornuf (2019) argue that infrastructure and compliance are foundational elements of digital finance, the insignificant results in the BPR context may stem from resource limitations and the relatively small scale of their operations. BPRs often rely on third-party solutions and fintech partnerships to fill infrastructure gaps, which diminishes the direct impact of their internal IT readiness on BPR.

The moderating role of digital adoption (ALD) yielded mixed results. The interaction between digital adoption and technology infrastructure (H5) is marginally significant ($\beta = -0.673$, $p = 0.050$), suggesting that higher adoption levels can alter the effect of IT readiness on collaboration. However, the moderating effects of ALD on regulatory compliance (H6) and human resources (H7) were insignificant. This aligns with Devi and Utamajaya (2025), who suggest that adoption compensates for structural weaknesses only to a limited extent and cannot replace the strategic roles of human capital and governance. Overall, these findings confirm that human capital remains the key enabler of BPR digitalization, while infrastructure and regulatory readiness are long-term challenges requiring structural investment and regulatory support. The results further support the argument that selective digital adoption can enhance collaboration opportunities but must be accompanied by HR development programs to generate sustainable transformation (Frost, 2020; Thakor, 2020).



Figure 2. Open Banking Explained

5. Conclusions

5.1. Conclusion

This study examined the factors influencing collaboration between Rural Banks (BPRs) and fintechs in Depok City through the lens of digital transformation. The findings demonstrate that human resource readiness (SDM) plays the most significant role in fostering effective collaboration, confirming the importance of digital competence and adaptability of employees. Conversely, technology infrastructure (IT) and security & regulatory compliance (KKR) did not have significant effects, suggesting that small financial institutions rely heavily on partnerships with fintechs to overcome structural and regulatory limitations. Moreover, the adoption of digital services (ALD) showed a partial moderating effect, indicating that adoption may strengthen or weaken the role of infrastructure but cannot fully substitute for human capability. These results emphasize that human capital is the central enabler of digital transformation, while technology and regulatory readiness remain long-term priorities.

Digital service adoption (ALD) demonstrated a partial moderating effect, meaning it can strengthen or weaken the impact of infrastructure on collaboration but cannot replace human capabilities. These findings highlight that human capital is the primary enabler of successful digital transformation, whereas technology and regulatory readiness remain supportive, long-term priorities. For BPRs, investing in workforce skills and fostering a digital-oriented organizational culture are essential to maximize fintech collaboration and drive sustainable growth in digital financial services.

5.2. Limitations

This study examined the factors influencing collaboration between Rural Banks (BPRs) and fintech providers in Depok City within the context of digital transformation. The results indicate that human resource readiness (SDM) is the most influential factor, with employee digital competence, adaptability, and organizational support significantly enhancing collaboration in the workplace. In contrast, technology infrastructure (IT) and security and regulatory compliance (KKR) showed no significant direct effects, suggesting that small-scale banks rely on fintech partnerships to overcome resource and regulatory limitations.

5.3. Suggestions

Future research should broaden the scope by including a larger and more diverse sample of BPRs across Indonesia to improve the generalizability of the findings. Longitudinal studies are also recommended to capture the evolving nature of digital transformation and FinTech collaboration over time. Additionally, incorporating macroeconomic and regulatory variables could provide deeper insights into the external factors influencing BPR–fintech partnerships.

From a practical perspective, BPRs should prioritize digital training programs to enhance employee skills and their readiness to collaborate with fintech providers. Policymakers, on the other hand, must develop regulatory frameworks tailored to small financial institutions, enabling innovation while minimizing compliance burdens. Fintech collaborations should be structured as strategic partnerships that address BPRs' limitations in technological infrastructure and regulatory compliance while simultaneously improving service quality, operational efficiency, and customer trust. By aligning human resource development, regulatory support, and strategic fintech partnerships, BPRs can achieve sustainable growth and strengthen financial inclusion in Indonesia.

5.4. Implications for Practice

1. BPRs should prioritize continuous HR development through digital literacy training, upskilling, and change-management programs.
2. Partnerships with fintech companies should be framed as capacity-enhancing collaborations that allow BPRs to overcome infrastructure limitations.
3. Policymakers and regulators must provide flexible regulatory frameworks tailored to smaller institutions, such as BPRs, to accelerate digital adoption without imposing disproportionate compliance burdens.

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