GLOBAL DIGITAL ERA, SOCIAL, PEACE & BUSINESS PERSPECTIVES IN SOCIETY

Editors

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NCM Publishing

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Published by: NCM Publishing House

Publishing Date: 09.01.2024

ISBN: 978-625-98685-2-3

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Publication No: **19**

Editors	***Assoc. Prof. Dr. Muhammad Ali Tarar***
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Cover Designer	***Mr. Kerim KARADAL***
ISBN	**978-625-98685-2-3**
Publisher Certificate No	**51898**
Publisher Type	International Publishing House
Release Date	2024

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LIBRARY INFORMATION CARD

Tarar, Muhammad Ali and ; Ahmad, Muhammad Saghir; Walambuka, Lawrence; Editor, 1, 2024. **Global Digital Era, Social, Peace & Business Perspectives in Society**. NCM Publishing House, Bursa.
Language: English
Editors: Assoc. Prof. Dr. Muhammad Ali Tarar; Dr. Muhammad Saghir Ahmad, Lawrence Walambuka
ISBN: **978-625-98685-2-3**

PREFACE

How well people work together is a crucial factor in the success of any business & organization. Social behavior and good leadership play important role in adoption of new innovations, technologies, and skills that ultimate change the pattern of communication to promote business, enhance sales and strengthen organization and industry in present era. The development of the Industrial Revolution brought changes to the adjustment of work in humans, machines, technology and processes in various professional fields, including the accounting profession. The Industrial Revolution requires the accounting profession to adapt to the development of information technology and big data. Facing today's latest industrial era, the development of the digital economy has opened new possibilities while simultaneously increasing risk. These changes have a significant impact on the development of accounting. In this era, technological developments and innovations seem to keep pace with time. New innovations encourage the creation of new markets and shift the existence of old markets. Smart machines and robots are now taking on many roles and seem to rule the world. In the Industrial Revolution 4.0 there was an extraordinary shift in various fields of science and profession, therefore the way accountants work, and practice needs to be changed to improve service quality and global expansion through online communication and the use of cloud computing and artificial intelligence.

Thank you for the hard work of the Steering Committee who has assessed the articles to be published in Social Behaviour, Leadership, Sales, Communication, Organization, Branding, Feasibility Analysis for Business Management: Inquiries with New Approaches in the Post-Pandemic Era.

This publication is dedicated to the world of science in the field of Accounting which is currently growing so rapidly. The development of Cloud Computing and Artificial Intelligence has played a role in changing the work order of Accountants.

Assoc. Prof. Dr. Muhammad Ali Tarar
Bursa – January 2024

CONTENTS

CHAPTER 1

Does Digital Transformation Affect Banks' Resilience? A Perspective Analysis of Strategic IT Governance Competence 2.0 in Commercial Bank in Indonesia

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ABSTRACT

The COVID-19 pandemic has accelerated sustainability and digital transformation across industrial sectors. This situation encourages banks to adopt financial technology (fintech) and its aligned governance structures. So far, IT governance is dominated by the silo management paradigm, which is the main challenge in aligning strategy. Top management teams face the challenge of increasing strategic IT governance competence (ITGOV) following increasing regulations and best practice standards. In addition, banks are also required to disclose action plans on sustainable finance and risk management of information technology (IT). This research develops an ITGOV Index based on the COBIT5 standard. We use content analysis of banks' annual report disclosure as a proxy for the maturity level of ITGOV practices, consisting of leadership and project process excellence. We examine the effect of the ITGOV Index on the banks' resilience through fintech adoption, operational efficiency, and profitability. We use the I/O Intermediation Stochastic Frontier Analysis to determine the technology change of 40 banks listed on IDX during 2015–2021. The research results show that ITGOV does not directly affect bank resilience, but there is a mediating role in fintech adoption and operational efficiency. Besides that, ITGOV harms profitability in the early stages due to adapting the governance structure. However, the sensitivity analysis shows that the negative effect weakens at t+1 and t+2 as the maturity level of ITGOV increases, potentially increasing bank resilience. The results give practical implications for commercial banks and policy recommendations for regulators to accelerate sustainable digital transformation.

Keywords: Strategic IT governance competence, Fintech adoption, Operational efficiency, Profitability, Banks resilience.

1.1 INTRODUCTION

The global crisis has taught us a valuable lesson: excessive emphasis on financial aspects can result in the oversight of social and environmental considerations, leading to failures within the financial system and the emergence of reputation risks. Over the past decade, the banking sector has endeavored to rebuild its reputation by devising an action plan on sustainable finance (Agirre-Aramburu & Gomez-Pescador, 2019), complemented by investments in financial technology (Fintech) (Zuo et al., 2021). Implementing sustainability strategies aims to foster the sustainability of the natural environment, human society, and the economy, with anticipated effects on operational efficiency, profitability, and bank resilience. (Nosratabadi et al., 2020).

Through the integration of Fintech, financial institutions can offer cutting-edge services (Tseng & Guo, 2022) encompassing payment systems, electronic money, online loans, big data, blockchain, cloud computing, artificial intelligence, and smart contracts, resulting in significant transformations to banking operations (Zuo et al., 2021). The adoption of Fintech also empowers banks to leverage machine learning algorithms and big data analytics for more effective credit decision-making (Cheng & Qu, 2020) and to employ intelligent investment advisors in guiding investment choices and financial supply chains (Tantri, 2020). Consequently, Fintech presents a formidable challenge for banks to enhance the inclusivity and effectiveness of their control systems and risk management procedures (Weber et al., 2017).

Integrating Fintech into banking strategies introduces additional risks (Sutarti et al., 2019; Helen, 2021; Thakor, 2021). Numerous case studies reveal that a significant number of companies incurred losses during the process of transitioning their information technology (IT) infrastructure. On average, IT project implementations surpass the allocated budget by 27%, with one in six projects experiencing cost overruns of up to 200% (Forbes, 2021). Furthermore, a PwC study examining 10,640 IT projects disclosed that merely 2.5% were completed within the designated timeframe, while the majority still needed to meet objectives and exceed the predetermined budget. These findings underscore that governance issues associated with digital transformation extend beyond the execution phase, presenting a much more intricate challenge (Weinzeimer, 2023).

Following the recovery from the global crisis in 2010, the financial services sector in Indonesia has established sustainable finance regulations aimed at constructing a corporate sustainability system, which includes the Risk Governance Framework (RGOV) (FSB, 2013; Karyani et al., 2019). This initiative involves the formulation of the Roadmap to Sustainable Finance, expanding information disclosure guidelines associated with the Action Plan on Sustainable Finance (OJK, 2017), and introducing the Green Taxonomy (OJK, 2021). These measures are designed to incentivize structural changes across all industrial sectors and address acute and chronic climate change risks (TCFD, 2021; IFRS, 2021). The financial services sector is anticipated to take the lead in driving the transition toward a low-carbon economic system, accomplishing this through incorporating environmental, social, and governance (ESG) screening in allocating credit and investment (Schoenmaker, 2017).

More empirical research needs to examine the impact of aligning sustainability strategy with IT strategy, except Zuo et al. (2021), who investigated sustainability innovation in commercial banks in China. Their study revealed that investments in digitalization significantly enhanced production efficiency. This observation aligns with research conducted in Indonesia, where the level of sustainability innovation in the banking sector is moderate. In the initial stages, the banking industry prioritizes a balance between financial, social, and environmental considerations, which may initially have a detrimental effect on profitability. However, operational efficiency positively mediates (Anis et al., 2023). The appropriateness of contextual factors exhibits a favorable impact on performance and serves as a moderating

factor in the influence of innovation capability on the performance of strategic business units within the banking sector (Berman, 2012; Anis & Shauki, 2023).

Moreover, statistics from the Ministry of Information of the Republic of Indonesia revealed that 888,711,736 cyber threats were recorded throughout 2020, translating to an average of 42 threats per second (OJK, 2022). The risks associated with digital transformation encompass the potential for personal data breaches and cyberattacks, which can be exacerbated by limited digital technology literacy and uneven infrastructure development (CNBC, 2021). Despite implementing Bank Indonesia Regulation Number 9/15/PBI/2007 and SEOJK Financial Services Authority Circular Letter No.21. 2017 focuses on Commercial Bank IT Risk Management, and the Digital Maturity Assessment for Banks (DMAB) indicates that the maturity level of IT governance within the banking sector in Indonesia remains relatively low at 50%. This level must be deemed sufficient to adequately support the transition and sustainability transformation efforts (OJK, 2021).

Studies focusing on digital transformation underscore the significance of strategic alignment, characterized by the appropriate coherence between business strategy and IT strategy (Henderson & Venkatraman, 1999). Nevertheless, there needs to be more consensus among researchers regarding the optimal approach for gauging the impact of digital transformation on company performance (Coltman et al., 2015). Typically, research relies on static alignment models, offering limited practical guidance on enhancing IT-business alignment (Luftman et al., 2017). Studies predominantly conducted in developed nations consistently report a robust correlation between strategic alignment, agility, and overall performance. However, ongoing debate remains concerning the type of alignment that contributes most significantly to performance outcomes (Panda & Rath, 2018; Panda, 2022).

Conversely, studies about sustainability transformation have underscored the substantial costs associated with such initiatives, which can disrupt the operational efficiency of banks (Nidumolu et al., 2009). Despite the costs, sustainability endeavors have been shown to enhance a bank's reputation and decrease capital costs by facilitating more accessible access to funding (Bassen et al., 2020). These initiatives also contribute to fortifying industry standards and elevating competitors' costs (Clarkson et al., 2011). The overarching findings from the research suggest that the positive impacts of sustainability outweigh the negative consequences. Therefore, the hypothesis that sustainable banks are more efficient than conventional banks can be substantiated.

There have been limited studies that explore the profitability of sustainable banking comprehensively (Platovova et al., 2018). Empirical findings suggest that sustainability initiatives contribute profitability in banks, with market forces playing a significant role in determining profitability for conventional banks. But, market forces do not exert the same level of influence on the profitability of sustainable banks. Despite increased costs, both conventional and sustainable banks exhibit high profitability. Consequently, it can be asserted that the market power hypothesis is less relevant in explaining sustainable banks' profitability than conventional banks (Olmo et al., 2021).

Another constraint lies in applying stakeholder, legitimacy, and institutional theory within sustainability research, which has limitations in elucidating the political-economic facets of the sustainability transformation process. In contrast, the examination of the digital transformation process is predominantly conducted in an empirical setting utilizing the Contingency and Diffusion of Innovation theory. However, this approach is constrained to evaluating the interaction of two variables based on managerial selection and a restricted analysis employing a systemic approach. At the practical field level, contemporary literature underscores the emergence of a novel paradigm: strategic IT governance competence 2.0 (ITGOV). This paradigm incorporates the active involvement of top management teams (TMTs) in aligning and spearheading IT project execution (Weinzeimer et al., 2023, p. 19).

The overview above underscores the intricacies of strategy, necessitating a thorough analysis to mitigate insolvency risk, particularly in the financial services sector grappling with substantial losses from credit defaults, elevated uncertainty levels, and constrained funding (Valencia, 2017). This situation holds significant importance as insolvency risk extends beyond individual banks, impacting the entire financial system (Scholten & Klooster, 2019). Aligning sustainability with IT strategies proves instrumental in mitigating the risk of bankruptcy, as it enhances brand image, attracts customers, and diminishes reputation risks (Bassen et al., 2020). Sustainable banks, characterized by transparency and elevated moral standards, are better positioned to alleviate adverse selection and moral hazard concerns (Lopatta et al., 2016). Consequently, the proposition is that sustainable banks have lower risk than conventional banks.

This study aims to bridge the existing research gap by approaching the Analysis through a lens of governance and competence (capability) (Williamson, 1999). Governance challenges top management teams (TMTs) competence in minimizing economic transaction costs by making strategic choices in routine business processes that align with regulations and adhere to standard best practice guidelines (Teece et al., 2007). This research examines the impact of strategic IT governance (ITGOV) competence on banks' resilience, utilizing agility as a proxy for the number of fintech adoptions and operational efficiency. This scrutiny gains significance due to the heightened regulatory environment in responding to financial crises, which prompts investment and adoption of technological innovations influencing operational efficiency. This exploration will unveil distinctions between efficient and inefficient banks (Olmo et al., 2021).

This study introduced the ITGOV Index, formulated by aligning sustainability regulations, risk management, and the COBIT5 standard. Additionally, data on bank ITGOV practices was acquired through content analysis of annual reports. The theoretical frameworks guiding this research encompass New Institutional Economics, Dynamic Capability, Diffusion of Innovation, and Contingency theory. The subsequent sections of the paper are organized as follows: Part 2 delves into the literature review and hypotheses, Part 3 outlines the research methods, Part 4 presents the research results, and Part 5 concludes with insights, implications, limitations, and directions for future research.

1.2 LITERATURE REVIEW AND HYPOTHESIS

2.1. Theoretical underpinning of strategic IT governance competence 2.0

The New Institutional Economic (NIE) theory, as articulated by Williamson (2000), posits that the pace of organizational adaptation can be assessed within a four-level institutional framework. Firstly, the internalization of social and ethical norms ensures that spontaneous behavior evolves over a timeframe of 100 to 1000 years. Secondly, the state-level institutional environment, with establishing property rights, offers first-order economic opportunities within 10-100 years. Thirdly, if corporations adopt state-level institutions and integrate them into contractual arrangements with stakeholders, it yields second-order economic opportunities within 1-10 years (Williamson, 2022). Lastly, allocating resources and employment, coupled with incentives and rewards, secures profit margins in routine business processes. The speed of adaptation is contingent on causal relationships between institutional levels, with change typically originating from lower to higher institutional levels. However, change is not always positive, as opposing influences between institutional levels can create counteractive effects that impede adaptation (Williamson, 2000).

Dynamic Capability theory proposes that organizations embrace flexible governance beyond legal compliance (Teece et al., 1997). Incorporating digital technology enables organizations to enhance their agility (Cˇirjevskis, 2017), contingent upon IT-business alignment. Agility, viewed as a high-level organizational capability, is systematically

cultivated through prolonged learning efforts (Mao et al., 2015). Contrarily, Contingency theory asserts that no one-size-fits-all management system is applicable across all scenarios. Instead, an effective organization fits with the contextual factors within its environment (Drazin & Van de Ven, 1985).

A robust risk governance framework (RGOV) plays a pivotal role in risk mitigation, as emphasized in the "Corporate Governance Lessons from the Financial Crisis" (OECD, 2014). RGOV is characterized by the shared responsibility of the board, chief risk officer (CRO), and chief information officer (CIO) in making IT investment decisions and overseeing risks as part of an enterprise-wide management system (Weinzeimer, 2023). A new senior management role has emerged within sustainable companies — the chief sustainability officer (CSO), responsible for spearheading the sustainability transition and transformation. The board of directors (BOD) is responsible for establishing the bank's risk appetite and principles, with support from the Board Risk Management Committee (BRMC), which regularly reports on risk exposure, profile, concentration, and trends. Meanwhile, CROs independently assess credit, market, operational, liquidity, and other key management risks daily (FSB, 2013).

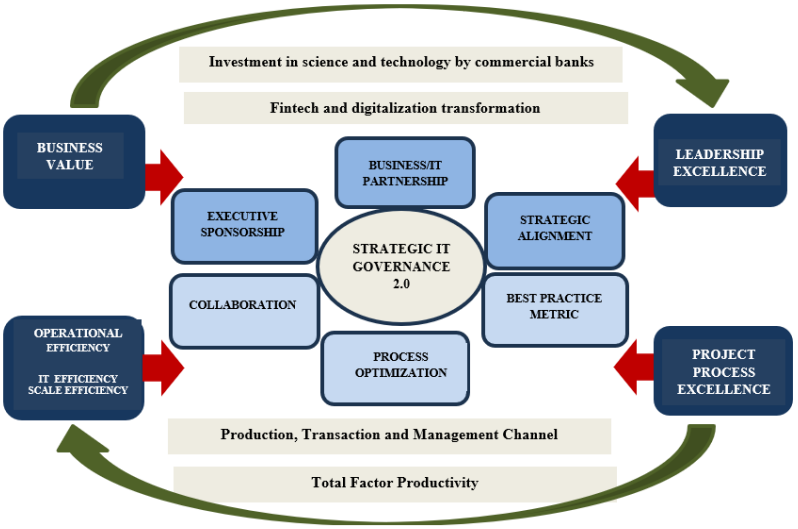

Figure 1. Strategic IT Governance Competence 2.0
Sumber. Diadaptasikan dari (Weinzimer, 2023) dan (Zuo et al., 2021)

As illustrated in Figure 1, the strategic IT governance competence (ITGOV) model encompasses A) IT Leadership excellence in generating business value through 1) sponsoring IT projects, 2) collaborating with stakeholders, and 3) aligning IT strategy; B) Excellence in executing IT projects by 4) fostering collaboration, 5) optimizing processes, and 6) employing best practice metrics (Weinzimer, 2023). These six domains collectively ensure the efficacy of IT investments (Lee & Mithas, 2008). Organizational (individual) innovativeness, as categorized by the Diffusion of Innovation (DOI) theory, includes the first mover firm (early adopter), the deliberate adopter (early majority), and late majority (laggard firm) (Rogers, 1983; 2004).

Based on the theory, conceptual literature, and prior empirical investigations, the research framework is depicted in Figure 2 below.

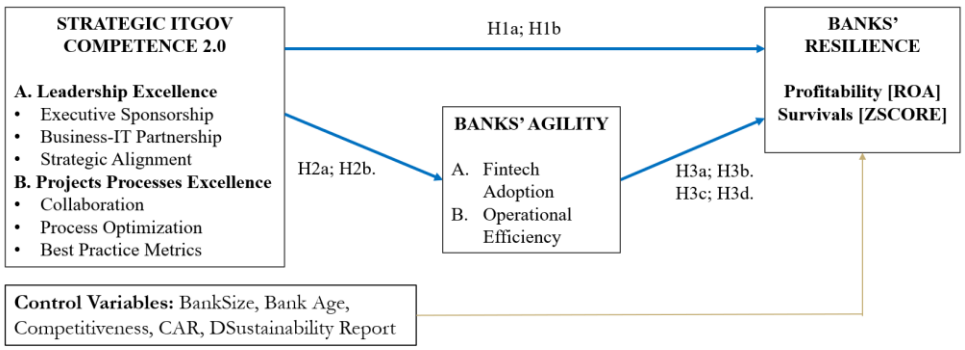

Figure 2. Research framework

2.2. Strategic IT governance competence and banks' resilience

Past studies have identified a positive correlation between IT-business strategic alignment and performance (Panda, 2022). The engagement of top management teams (TMTs) in sponsoring IT projects and aligning strategies has demonstrated efficacy in cost control, profitability enhancement, market growth, and the promotion of innovation capabilities (Chan et al., 1997),

Recent investigations have revealed the impact of strategic alignment on corporate agility (Panda & Rath, 2018), positioning it as a precursor to performance (Panda, 2022). According to the dynamic capability theory, corporate agility is considered a high-level capability intentionally developed through long-term learning (Teece, 2007). Strategic ITGOV competence fosters communication and coordination between IT units, departments, managers, and business executives. This dynamic enhances the quality of decision-making in IT development and related alignment activities. ITGOV is crucial for fostering a robust banking system, a key element in safeguarding sustainable economic growth (Wu et al., 2015). ITGOV competency further leads to collaborative governance and the realization of enhanced IT business value. Recognizing alignment as a dynamic concept necessitates examination from a process-oriented perspective to mitigate risks and sustain profit stability (Tallon, 2008). Strategic IT governance competence is explored as a construct linked to the learning process, with an anticipated impact on banking resilience. This premise forms the basis for the following hypothesis.

H1a. Strategic IT governance competence positively affects banks' profitability.

H1b. Strategic IT governance competence positively affects banks' survival.

2.3. Strategic IT governance competence and banks' agility

In line with the Diffusion of Innovation (DOI) theory, the transformation process unfolds as a protracted learning journey with outcomes realized incrementally through stages (step-by-step innovation model) (Rogers et al., 1983). Effective strategic alignment hinges on knowledge sharing between the top management team and senior IT management, fostering increased coordination and collaboration. This proactive approach enables the top management team to assess the situation before responding to environmental conditions (Barki & Pinsonneault, 2005). Knowledge sharing exemplifies agility in embracing exploitative innovations, enhancing business practices, optimizing product creation costs, and exploring novel services and distribution channels (Lavie & Rosenkopf, 2006; Anis & Shauki, 2023).

A culture of knowledge sharing can be expanded to involve business partners, customers, and suppliers, creating opportunities for IT and business alignment and enriching comprehensive strategic decision-making. Consequently, strategic ITGOV competence nurtures agility, empowering organizations to steer the direction of change. This competency supports top management teams (TMTs) in scanning environmental conditions, encouraging organizations to proactively scale up product and service offerings to address uncertainty. As

a result, strategic ITGOV competence promotes efficient resource utilization, enabling the detection and identification of changes (Tallon, 2008). Moreover, ITGOV enhances core business process reengineering capabilities to adapt to change and foresee threats and opportunities. ITGOV develops flexible responses to market changes by concentrating on internal business processes, enhancing operational efficiency, and boosting profits. Hence, the second hypothesis is formulated as follows:

H2a. Strategic ITGOV competence positively affects the adoption of fintech innovation

H2b. Strategic ITGOV competence positively affects banks' operational efficiency.

2.4. The mediating role of banks' agility on the relationship between strategic IT governance competence and banks' resilience

To transform into a sustainable bank, top management teams (TMTs) must articulate objectives that consider meeting the needs of local communities, environmental protection, and fostering healthy economic prospects (Boitan, 2018). Attaining this objective involves TMTs avoiding excessive risk-taking and implementing effective risk-management strategies (Cui et al., 2008). Building positive stakeholder relations becomes instrumental in garnering local support, attracting customers, and mitigating bank risks (Panda & Rath, 2018). Environmentally friendly actions by banks reduce reputation risks and enhance customer loyalty, contributing to funding stability (Bassen et al., 2020).

In a dynamic environment, employees' entrepreneurial spirit determines organizational agility, which is evident in their prompt response to customer requests (Cai et al., 2013). Market capitalization plays a crucial role in decision-making regarding products and services (Panda, 2022), with profitability as a vital indicator of improved performance. Furthermore, organizations endowed with high strategic ITGOV competence can integrate internal resources, modify product and service schemes, and operate more efficiently. Ultimately, strategic alignment enhances customer trust, enabling organizations to navigate market fluctuations, gain competitive advantage, and achieve higher performance.

Aligned with NIE theory, the pace of organizational adaptation is shaped by reciprocal two-way relationships across institutional levels at the country level, organizational governance through performance contractual agreements and resource allocation, and incentive and reward arrangements (Williamson, 2000). In contingency theory, organizational change transpires through collective action, exerting systemic effects on community life. Given the existing research demonstrating the positive impact of fintech adoption on innovation capability (Anis & Shauki, 2023) and agility (Panda, 2022), alongside the mediating role of operational efficiency on profitability (Sutarti et al., 2019; Anis et al., 2023), the ensuing hypothesis is formulated as follows:

H3a. The fintech adoption positively mediates the relationship between strategic ITGOV competence and banks' profitability.

H3b. The adoption of fintech positively mediates the relationship between strategic ITGOV competence and banks' survival.

H3c. Banks' operational efficiency positively mediates the relationship between strategic ITGOV competence and banks' profitability.

H3d. Banks' operational efficiency positively mediates the relationship between strategic ITGOV competence and banks' survival.

1.3 METHODOLOGY

3.1. Sample framework and data collection

The research sample comprised 40 banks on the Indonesia Stock Exchange spanning 2015 to 2021, constituting 280 bank-years. Indonesia has progressed through Sustainable Finance Journey Phase I (2015-2019) and is presently in Sustainable Financial Journey Phase II, emphasizing the establishment of corporate sustainability systems (CSSs). The anticipation is

that strategic ITGOV competence will expedite shifting toward a circular economic system (OJK, 2021).

3.2. Research design and regression model

Three main models were developed to test the following hypotheses

Model 1: Effect of strategic ITGOV competence on banks' resilience

$$ROA_{it} = \alpha_0 + \alpha_1 ITGOV_{it} + \alpha_2 LNSIZE_{it} + \alpha_3 LNAGE_{it} + \alpha_4 CAR_{it} + \alpha_5 CMPT_{it} + \alpha_6 DSR_{it} + \varepsilon$$

$$ZSCORE_{it} = \beta_0 + \beta_1 ITGOV_{it} + \beta_2 LNSIZE_{it} + \beta_3 LNAGE_{it} + \beta_4 CAR_{it} + \beta_5 CMPT_{it} + \beta_6 DSR_{it} + \varepsilon$$

Model 2: The effect of strategic ITGOV competence on banks' agility

$$FINTCH_{it} = \rho_0 + \rho_1 ITGOV_{it} + {}_2 LNSIZE_{it} + \rho_3 LNAGE_{it} + \rho_4 CAR_{it} + \rho_5 CMPT_{it} + \rho_6 DSR_{it} + \varepsilon$$

$$OPREFF_{it} = \lambda_0 + \lambda_1 ITGOV_{it} + \lambda_2 LNSIZE_{it} + \lambda_3 LNAGE + \lambda_4 CAR_{it} + \lambda_5 CMPT_{it} + \lambda_6 DSR_{it} + \varepsilon$$

Model 3: The mediating role of banks' agility on the relation between strategic ITGOV competence and banks' resilience

$$ROA_{it} = \varphi_0 + \varphi_1 ITGOV_{it} + \varphi_2 FINTCH\_FIT_{it} + \varphi_3 OPREFF\_FIT_{it} + \varphi_4 LNSIZE_{it} + \varphi_5 LNAGE_{it} + \varphi_6 CAR_{it} + \varphi_7 CMPT_{it} + \varphi_8 DSR_{it} + \varepsilon$$

$$ZSCORE_{it} = \pi_0 + \pi_1 ITGOV_{it} + \pi_2 FINTCH\_FIT_{it} + \pi_3 OPREFF\_FIT_{it} + \pi_5 LNSIZE_{it} + \pi_6 LNAGE_{it} + \pi_7 CAR_{it} + \pi_8 CMPT_{it} + \pi_9 DSR_{it} + \varepsilon$$

The hypothesis will be accepted under condition:

H1a,b: α_1; $\beta_1 > 0$; H2a,b: ρ_1;$\lambda_1 > 0$; H3a,b: $\varphi_2, \varphi_3, \pi_2, \pi_3 > 0$.

3.3. Operational Variables

The independent variable in this study is the self-constructed ITGOV Index, which serves as a proxy for the maturity level of ITGOV practices. The development of the ITGOV Index assumes that increased regulation will result in the convergence of various governance systems (Salvioni et al., 2016). The ITGOV Index was formulated by mapping sustainability regulations (FSB, 2013; KNKG, 2021; SEOJK No.21. 2017) onto the ITGOV model. Criteria were then developed based on the IT COBIT5 standard. The ITGOV Index emerged from content analysis of information disclosure, encompassing 6 Domains, 18 Subdomains, and 40 ITGOV practice criteria. Scoring was done using the Capability Maturity Grid: Score 1 (Index $\leq$ 0.25: Unaware-Undisciplined), Score 2 (Index $\leq$ 0.50: Open-minded-Reactive), Score 3 (Index $\leq$ 0.75: Widely practiced-Proactive), and Score 4 (Index $\leq$ 1.00: Walk the Talk-Enterprise culture). For a detailed overview of the ITGOV development process and criteria, please refer to the following link: https://drive.google.com/file/d/1R4ovvajHt8RbN_Z9DDCjGp8DV_5yFIwd/view?usp=sharing

The dependent variable in this study is banks' resilience, gauged through a measure of capital risk-taking, proxied by bank profitability (ROA) and survivals (ZSCORE), indicating a bank's distance from insolvency (Bolton, 2013). ZSCORE is calculated as the return on assets (ROA) plus the capital-to-asset ratio divided by the standard deviation of return on assets (σ(ROA). A higher ZSCORE denotes a more stable financial condition for the bank (Boyd et al., 2006).

The mediating variables include banks' agility, with three proxies: (1) fintech adoption, (2) operational efficiency, and (3) profitability. Fintech adoption involves strategic expenditure with ten criteria: 1) ATMs; 2) SMS banking; 3) EDC electronic payment; 4) Mobile banking; 5) Internet banking; 6) Video banking; 7) Phone banking; and 8) Credit cards (Sutarti et al., 2019), and 9) Enterprise resources planning, 10) Enterprise risk management (Otley, 2016). A bank is assigned a score of 1 for each disclosed fintech adoption criterion, with a total score ranging from 1 to 10. Fintech adoption is measured by the sum of fintech adoption scores divided by the total score and multiplied by 100% (FINTCH $\leq$ 1).

Operational efficiency is represented by 'technology change,' reflecting a deviation in the non-parallel cost curve that illustrates how the bank minimizes output production costs, adjusts the input mix, and enhances efficiency within a specific technological state. The measurement of technology change is based on the current technology state (meta frontier) connected to the available best technology set, utilizing the input-output model of intermediary stochastic frontier analysis (SFA) in two stages. The initial step involves calculating operational efficiency as follows:

$$TC_{it} = f^{*}(w_{it}, y_{it}, z_{it})e^{v_{it}+u_{it}} \quad \textbf{(a)}$$

$$LN\_TC_{i,t} = \zeta_0 + \zeta_1 LNFixAsset_{I,t-1} + \zeta_2 LNHrd_{i,t-1} + \zeta_3 LNDeposit_{i,t-1} + \zeta_4 NegEarn_{I,t-1} + \zeta_5 Growth_{i,t} + \zeta_6 CashR_{it} + \zeta_7 DebtR + \zeta_8 EquityR_{it} + \zeta_9 NPL_{it} + \zeta_{10} NIM_{it} + \zeta_{11} FOWN_{it} + \zeta_{12} DDIV_{it} + \zeta_{15} D\_M\&A_{it} + \varepsilon_{it} \quad \textbf{(b)}$$

Where w: input price vector, namely investment in fixed assets and technology, human resources, third party fund savings; y: output vector, namely the amount of financing and investment allocation; z: vector of bank risk profile such as financial conditions (Andries et al., 2016) as well as institutional factors influencing innovation adoption (Zuo et al., 2021) such as foreign-owned banks, bank mergers and acquisitions (Bos et al., 2013); v: random noise iid N (0, σv); μ: inefficiency term N|(μ, σv). The error term eit=mit + uit describes the overall specific inefficiency. In the second stage, banks functioning on the annual cost frontier, signifying no inefficiency, attain a cost efficiency value 1. In contrast, inefficient banks operate above and below the annual cost frontier, resulting in an efficiency score below 1 (<1). The absolute distance between the annual cost frontier and the meta cost frontier hinges on whether the annual cost frontier surpasses the total cost meta frontier. Technology gap is calculated as GAPit = f meta (wit, yit, zit) / f * meta (wit, yit, zit). Innovation adoption will reduce GAPit due to technological change (meta frontier). Next, to get an interpretation of the direction of the positive influence of strategic ITGOV competence on operational efficiency, the GAPit value is multiplied by minus one (-1).

This research controls bank size represented by the natural logarithm of total assets (LNSIZE), bank age (LNAGE), capital adequacy ratio (CAR) (Karyani et al., 2019), competitiveness level proxied by the Lerner index (CMPT) (Bos et al., 2013), along with a dummy variable set to 1 if the bank issues a sustainability report (DSR).

3.4. Endogeneity issues

This study recognizes endogeneity as a significant governance challenge. Some researchers posit that the governance structure of directors and boards is influenced by past performance (Karyani et al., 2019), while others contend that the governance structure is shaped by dynamic endogeneity factors (Nahar et al., 2016). In the banking context, past performance does not dictate future risk governance. The composition of the board of directors and commissioners serve as a proxy (Adam & Mehran, 2012), alongside the count of committees and risk management units (Karyani et al., 2019). This research uses two-stage least squares (TSLS) to overcome endogeneity issues.

RESULT AND ANALYSIS

4.1. Strategic IT Governance Competence 2.0 (ITGOV) Index

The validity and reliability of the ITGOV Index were assessed using a significance level of 5% and an r-table of 0.113. All domains, subdomains, and criteria surpassed a value of 0.500, establishing the validity of the ITGOV Index. Additionally, Cronbach's alpha values for Leadership Excellence (LEAD) and Project Process Excellence (PROJ) were 0.902 and

0.890, respectively. These high values signify the ITGOV Index is both "valid" and "reliable," affirming its suitability for empirical testing.

4.2. Statistic descriptive and correlation between research variables

Table 1 presents the main variables' mean, standard deviation, and correlations. The mean of ITGOV Index is 0.722, with a standard deviation of 0.158, indicating a capability maturity level 3 (Widely practiced/Proactive). This result suggests a transition towards a higher emphasis on Environmental and Social aspects than Financial aspects, aligning with the shift from Sustainable Finance SF2.0 to 3.0 (Schoenmaker, 2017).

In terms of correlation, ITGOV exhibits a strong positive correlation with FINTCH and a weak positive correlation with OPREFF and CAR. On the other hand, ITGOV demonstrates a strong negative correlation with ROA, ZSCORE, and LNSIZE and a weak negative correlation with LNAGE, CMPT, and DSR.

4.3. Multivariate Testing

Hypothesis testing employs the estimation of a fixed-effect model using panel data. The outcomes of hypothesis testing are outlined in Table 2. Two sensitivity tests were conducted in this study. Firstly, it examines the impact of the ITGOV Domain and Sub-domain on bank agility, specifically fintech adoption, operational efficiency, and profitability. Secondly, assessing the influence of the ITGOV time-lag effect on bank profitability and resilience in years t+1 and t+2. **4.3.1. Analysis of the effect of strategic ITGOV on banks resilience**

The results from Model 1 indicate that strategic ITGOV competence harms profitability (ROA) ($\alpha 1$ = -0.799, p-value = 0.091) and banks' survivals (ZSCORE) ($\beta 1$ = -0.799, p-value = 0.182). Consequently, the hypotheses regarding the influence of ITGOV on bank resilience (H1a and H1b) are not substantiated by the data.

In the sensitivity tests, the negative impact on profitability weakens at t+1 (Coeff = -6.746, p-value = 0.091*) and t+2 (Coeff = -3.543, p-value = 0.251). The influence on banks' survivals varies, showing a positive effect at t+1 (Coeff = 0.967, p-value = 0.035**) and no effect at t+2 (Coeff = 0.080, p-value = 0.453). These results suggest a highly dynamic environmental condition for banks.

Consistent with prior research findings, the adverse effect on profitability may stem from a lack of alignment between IT and business strategy and a mismatch with customer needs (Kearns & Sabherwal, 2007). Furthermore, a low capacity for innovation can lead banks to miss opportunities to enhance efficiency and gain a competitive edge (Oh & Pinsonneault, 2007; Yahya & Hu, 2012). In addition, insufficient attention to security and legal compliance may heighten the risks associated with data security, resulting in financial losses, erosion of customer trust, and legal consequences, which can diminish profitability and reputation, thereby affecting survival (Wu & Shen, 2011).

Additionally, adverse consequences may arise from the mismanagement of IT projects, encompassing cost, time, and quality issues, leading to implementation failures with potentially harmful ramifications. Project management errors can further impact resilience, making it challenging to adapt to changes or market pressures (Berman, 2012). There needs to be more planning and testing of disaster recovery strategies to increase the likelihood of data loss and unproductive downtime, impeding the business's capacity to operate seamlessly in the aftermath of unforeseen events (Panda & Rath, 2018).

Inadequate IT governance may lead to uncontrolled operational costs, such as a lack of control over IT resources, suboptimal vendor relationship management, or inefficient excess capacity, negatively impacting profitability. Simultaneously, the escalating regulatory demands challenge banks to adapt costly governance structures to accommodate TMTs' competence that aligns with regulatory requirements. The findings affirm the Dynamic

Capability theory, asserting that achieving resilience in banks necessitates strategic IT governance competence developed and integrated in a planned manner (Teece et al., 1997) within a long-term learning system (Chan et al., 1997). IT governance is pivotal for sustaining a healthy banking system, serving as a cornerstone for safeguarding sustainable economic growth (Wu & Shen, 2011).

Table 1. Mean, standard deviation, and correlation between research variables

	Mean	Stdev	ITGOV2.0	FINTCH	OPREFF	ROA	ZSCORE	LNSIZE	LNAGE	ROA_{t-1}	CAR	CMPT	DSR
ITGOV2.0	0.722	0.158	1										
FINTCH	0.784	0.174	0.058**	1									
OPREFF	0.762	0.192	0.042	0.097	1								
ROA	0.004	0.020	-0.081*	0.120	0.093	1							
ZSCORE	3.205	0.206	-0.030*	0.115	0.078	-0.025	1						
LNSIZE	13.500	0.185	-0.125**	0.522***	0.089	0.141**	0.118**	1					
LNAGE	2.637	2.208	-0.002	0.343***	0.031	0.062	-0.048	0.330***	1				
CAR	0.194	0.096	0.006	-0.156***	-0.259	-0.180	0.008	-0.160***	-0.084	0.263	1		
CMPT	0.852	0.249	-0.089	0.270***	0.025	0.046	0.158**	0.579***	0.043	-0.037	-0.133	1	
DSR	0.107	0.09	-0.122	-0.050	-0.019	-0.033	0.075	-0.238***	0.043	0.265***	-111**	0.132**	1

Note(s): *N=280; *** Significant at 1%; ** 5%; and *10%* Sources(s) = Data analysis from the Annual and Sustainability Report of each bank listed on the Indonesia Stock Exchange (IDX)

Table 2. Regression result model 1 (H1a,b), model 2 (H2a,b) and model 3 (H3a,b,c,d)

	Pred Sign	MODEL 1		MODEL 2		MODEL 3	
		ROA (H1a)	ZSCORE (H1b)	FINTCH (H2a)	OPREFF (H2b)	ROA (H3a;H3b)	ZSCORE (H3c:H3d)
Independent							
ITGOV	+	-0.564 (0.091)**	-0.799 (0.182)	0.254 (0.071)*	0.073 (0.043**)	-0.746 (0.051**)	-0.334 (0.102) *
FINTCH_FIT						0.250 (0.031**)	0.450 (0.041) **
OPREFF_FIT						0.023 (0.09*)	0.098 (0.075) *
Control							
LNSIZE	+/-	-0.156 (0.095)	-0.202 (0.101)	0.085 (0.000) ***	-0.075 (0.145) **	-0.042 (0.004)	-0.220 (0.082) *
LNAGE	+/-	0.032(0.065) *	0.027 (0.051) **	0.006 (0.001) ***	0.006 (0.053) **	0.002 (0.051)	0.027 (0.004**)
CAR	+/-	6.23 (0.041) **	7.54 (0.045) **	-0.999 (0.022) **	0.204 (0.315)	0.274 (0.256)	8.042 (0.033**)
CMPT	+/-	-0.453 (0.222)	-0.575 (0.242)	-0.275 (0.000) ***	-0.275 (0.000) ***	-0.121 (0.056)	-0.582 (0.234)
DSR	+/-	0.952 (0.015) **	0.952 (0.0112) **	0.139 (0.001) ***	0.135 (0.001) ***	0.052 (0.110)	1.012 (0.014**)
N		280	280	280	280	280	280
Adj R - Square		0.317	0.336	0.649	0.646	0.173	0.336
F Statistic		4.643	4.532	13.780	13.784	3.480	4.457
Prob (F-statistic)		0.000	0.000	0.000	0.000	0.000	0.000

Note(s): *N=280 Significant at 1%; ** 5%; and *10%* Sources(s) = Data analysis from the Annual and Sustainability Report of each bank listed on the Indonesia Stock Exchange (IDX

Table 3. Sensitivity analysis - the effect of domain and sub-domain of ITGOV on banks' agility and resilience at t+1 and t+

	Pred Sign	BANKS' AGILITY				BANKS' RESILIENCE			
		FINTCH t+1		OPREFF t+1		ROA t+1	ROA t+2	ZSCORE t+1	ZSCORE t+2
Independent									
ITGOVX	(+)					-0.746 (0.091*)	-0.543 (0.251)	0.967 (0.035**)	0.080 (0.453)
SPONSOR	(+)	0.049 (0.390)		-0.077 (0.132)					
PARTNER	(+)	-0.083 (0.270)		0.075 (0.302)					
ALIGNM	(+)	-0.458 (0.002**)		-1.146 (0.181)					
LEADER	(+)		-0.146 (0.023**)		-0.308 (0.033**)				
COLLAB	(+)	0.237 (0.085*)		0.255 (0.072*)					
OPTIMIZ	(+)	0.208 (0.035**)		0.004 (0.021**)					
METRIC	(+)	0.002 (0.410)		-0.004 (0.302)					
PROJECT			0.386 (0.004**)		0.223 (0.062*)				
Control									
LNSIZE	(+/-)	0.082 (0.000***)	0.086 (0.000)	-0.040 (0.001***)	-0.039 (0.015**)	0.007 (0.004**)	-0.005 (0.015**)	0.155 (0.201)	0.080 (0.450)
LNAGE	(+/-)	0.005 (0.000***)	0.005 (0.003**)	-0.041 (0.010)	-0.03 (0.090*)	-0.003(0.027**)	0.062 (0.361)	0.040 (0.014**)	0.012 (0.241)
CAR	(+/-)	0.562 (0.031**)	0.426 (0.061*)	0.651 (0.032**)	0.228 (0.302)	0.023 (0.064*)	-0.033 (0.035**)	0.878 (0.341**)	2.068 (0.111*)
CMPT	(+/-)	-0.261(0.007***)	-0.274(0.000***)	-0.114 (0.131)	-0.119 (0.054)	0.026(0.000***)	-0.019 (0.012)	0.255 (0.352)	-0.596 (0.191)
DSR	(+/-)	0.154 (0.000***)	0.139 (0.001***)	0.045 (0.140)	0.044 (0.142)	0.093 (0.065*	0.007 (0.113)	0.174 (0.370)	0.618 (0.122)
N		240	240	240	240	240	200	240	200
Adj R - Square		0.882	0.657	0.186	0.175	0.559	0.624	0.341	0.149
F Statistic		35.697	14.890	24.987	23.675	69.665	58.873	28.452	6.809
Prob (F. Statistic)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note(s): ****Significant at 1%; ** 5%; and *10%*
Sources(s) = Data and information analysis from the Annual and Sustainability Report of each bank listed on the Indonesia Stock Exchange (IDX)

4.3.2. Analysis of the effect of strategic ITGOV competence on banks' agility

The findings from hypothesis testing in Model 2 reveal that strategic IT governance competence positively influences fintech adoption (FINTCH) (ρ1=0.254, p-value=0.071) and operational efficiency (OPREFF) (λ1= 0.073, p-value=0.043**), supporting the hypotheses regarding the impact of ITGOV on bank agility (H2a and H2b).

The sensitivity test indicates that the positive effect on banks' agility stems from the opposing influence of the IT Leadership (LEAD) domain, which negatively impacts fintech adoption (Coeff= -0.146, p-value=0.023) and operational efficiency (Coeff= -0.308, p-value 0.033). Conversely, the IT Project Execution (PROJECT) domain exerts a positive effect on fintech adoption (Coeff=0.386, p-value=0.004**) and operational efficiency (Coeff=0.223, p-value=0.062*).

Moreover, the sensitivity test reveals that Executive Sponsorship and IT-business partnership have no effects, and even strategic IT-business alignment has a negative effect. However, this negative effect is offset by the positive impact of collaboration and process optimization, while best-practice metrics show no effect. These findings align with prior research emphasizing the vital role of IT Leadership, led by the Top Management Team (TMT), in establishing strategic priorities for effective resource allocation to support the adoption of relevant Fintech, positively impacting operational efficiency (Barki & Pinsonneault, 2005; Thakor, 2020; Carney, 2021; Helen, 2021).

The significance of IT Leadership extends to ensuring the integration of IT systems and architecture, involving developing and maintaining a cohesive IT architecture. Leadership Excellence in IT ensures seamless integration of bank information systems and applications with fintech adoption solutions, considering regulatory compliance and information security risks (Wu & Shen, 2011; Panda & Rath, 2018; Panda, 2022).

In IT Project Execution, banks' adaptability to environmental changes is paramount. Excellence in IT Project Execution empowers banks to adapt to necessary operational changes swiftly, leveraging new features for heightened operational efficiency, thereby averting resource wastage and project delays (Berman, 2012). This mechanism engages key stakeholders in decision-making to ensure that fintech adoption aligns with strategic objectives and supports operational efficiency (Panda & Rath, 2018).

The research findings align with the Diffusion of Innovation theory, emphasizing that the digital transformation process is a prolonged learning process with outcomes realized gradually (step-by-step innovation model) (Rogers et al., 1983). Through optimizing strategic IT governance competence, banks can maximize their potential for adopting fintech innovations and optimize overall operations (Berman, 2012).

4.3.3. Analysis of the mediating role of banks' agility on the relationship between strategic ITGOV and bank resilience.

The results of hypothesis testing for model 3, examining the mediating role of banks' agility in the impact of strategic ITGOV competence on bank resilience, indicate that fintech adoption (FINTCH) positively mediates the influence of ITGOV on profitability (ROA) (φ2=0.250, p-value=0.031**) and survivals (ZSCORE) (π2=0.450, p-value=0.041**). Additionally, operational efficiency affects profitability (φ3=0.023, p-value=0.09*) and survival (π3=0.098, p-value=0.075*). Thus, the data substantiates the hypothesis proposing the mediating role of banks' agility in the relationship between strategic ITGOV competence and bank resilience.

The research findings are consistent with prior studies, indicating that adopting Fintech, encompassing process automation, enhanced risk management, and the advancement of digital services, can directly enhance operational efficiency and business resilience. This situation is achieved through diversifying services like mobile banking, digital payments, and peer-to-peer lending (Zuo et al., 2021). The diversification of services contributes to bolstering the bank's resilience against economic risks and market fluctuations. Effective IT governance is crucial in aiding banks in strategically designing and managing this diversification of services (Thakor, 2021). Fintech adoption is a valuable tool for banks in improving risk management practices through advanced data analysis, artificial intelligence, and real-time monitoring.

Strategic ITGOV competence ensures banks establish robust information security infrastructure and policies, enhancing effective risk management and fortifying resilience against security threats (Cheng & Qu, 2020). Fintech adoption empowers banks to enhance the availability and affordability of their financial services. By leveraging Fintech, banks can respond promptly to evolving market dynamics and changing customer needs. Effective IT governance is pivotal in expediting decision-making processes and facilitating the swift implementation of technological changes necessary for maintaining competitiveness. The capacity to adapt rapidly contributes to elevating a bank's resilience in the face of fluctuations in the business environment.

In light of the details above, the results align with the NIE theory, suggesting that the organizational pace of adaptation is shaped by reciprocal relationships between institutional levels at the national scale, organizational governance through performance contracts, and the allocation of resources, incentives, and rewards (Williamson, 2000). Fintech adoption and operational efficiency connect strategic ITGOV competence with bank resilience, empowering banks to respond more to change and enhance resilience in confronting external challenges.

The findings from the control variable tests reveal that bank size exerts a negative influence on both profitability and survival. Conversely, bank age and capital adequacy ratio exhibit a positive effect, while banks publishing sustainability reports demonstrate higher profitability and survival than those not. The competitiveness level, however, needs to show more impact on bank resilience. The sensitivity test results at t+1 and t+2 indicate an attenuation of the negative influence and an augmentation of the positive influence, suggesting an enhancement in strategic IT governance competence over time.

4. CONCLUSION, IMPLICATION, LIMITATION AND FUTURE STUDIES

This study seeks to assess sustainability strategies through the lens of strategic IT governance competence. More precisely, it introduces the Information Technology Governance Index (ITGOV) as a representative measure for the strategic IT governance competence of banks listed on the Indonesia Stock Exchange (BEI) during the period 2015-2021 (280 banks-year). Subsequently, the research evaluates the impact of the ITGOV Index on bank resilience, gauged by banks' profitability (ROA) and survival (ZSCORE), through the prism of banks' agility proxied by fintech adoption and operational efficiency proxies.

The research results show an increase in the banking ITGOV Index in Indonesia during the observation period. Empirical test results show that ITGOV negatively impacts bank resilience, reducing profitability and survival. However, this negative effect diminishes with the increase in risk governance structure and ITGOV at t+1 and t+2. Strategic IT governance competence positively affects the adoption of fintech innovations and the operational efficiency of banks. This positive effect stems from various regulations affecting the domains and subdomains of banks' strategic IT competencies. Within the Leadership Excellence

domain, Executive sponsorship and IT-business partnerships do not impact banks' agility, while Strategic IT-business alignment has a negative effect.

Nevertheless, the negative effect is offset by the growing competence in IT project execution, where the IT-business collaboration and process optimization subdomain positively influence bank agility. However, the best-practice metrics subdomain has no effect. Furthermore, banks' profitability and operational efficiency (banks' agility) mediate between ITGOV and bank resilience. The research findings align with new institutional economics (NIE), dynamic capability (DC), diffusion of innovation (DOI), and Contingency theory. The study offers practical implications for the banking sector in digital transformation and sustainability, along with recommendations for reinforcing ESG practices and risk governance frameworks to expedite the transition to a low-carbon economy.

The study is subject to certain limitations, and avenues for future research are suggested. Firstly, the testing scope is confined to the banking sector in Indonesia, prompting a recommendation for broader testing within the non-financial industrial sector across different countries. Secondly, the ITGOV Index was exclusively developed through content analysis of seven-year annual reports. Future studies could incorporate longitudinal data and integrate interview procedures to understand companies' ITGOV practices better.

Acknowledgment

This research is a focus study of the Trisakti Governance Center. We want to thank Prof. Astri Rinanti, Director of the Institute for Research and Community Service Universitas Trisakti, for facilitating the presentation on the CEO Congress and publication as a book chapter of the conference.

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Idrianita Anis_Strategic ITGOV Competence and Banks Resilience

by IDRIANITA ANIS FEB

Submission date: 11-Dec-2023 09:36AM (UTC+0700)
Submission ID: 2236648628
File name: ence_and_Banks_Resilience__Idrianita_Anis_Version_02.edited.docx (384.85K)
Word count: 8496
Character count: 53084

DOES DIGITAL TRANSFORMATION AFFECT BANKS' RESILIENCE? AN ANALYSIS OF STRATEGIC IT GOVERNANCE COMPETENCE PERSPECTIVE IN COMMERCIAL BANK IN INDONESIA

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ABSTRACT

The COVID-19 pandemic has accelerated sustainability and digital transformation across industrial sectors. This situation encourages banks to adopt financial technology (Fintech) and its aligned governance structures. So far, IT governance is dominated by the silo management paradigm, which is the main challenge in aligning strategy. Top management teams (TMTs) face the challenge of increasing strategic IT governance competence (ITGOV) following increasing regulations and best practice standards. In addition, banks are also required to disclose action plans on sustainable finance and risk management of information technology (IT). This research develops an ITGOV Index based on the COBIT5 standard. We use content analysis of banks' annual report disclosure as a proxy for the maturity level of ITGOV practices, consisting of IT Leadership and IT Project process excellence. We examine the effect of the ITGOV Index on the banks' resilience (profitability and survivals) through banks' agility (number of fintech adoptions and operational efficiency). We use the I/O Intermediation Stochastic Frontier Analysis to determine the technological change of 40 banks listed on IDX during 2015–2021. The research results show that ITGOV negatively affects bank resilience in the early stages. The sensitivity test results show a weakening of the negative effect as strategic IT governance competence increases at t+1 and t+2. Furthermore, ITGOV positively affects fintech adoptions and operational efficiency (banks' agility) as a consequence of strengthening the risk governance framework. Bank agility plays a mediating role between ITGOV practice and bank resilience. The results give practical implications for commercial banks and policy recommendations for regulators to accelerate sustainable digital transformation.

Keywords: Strategic IT governance competence, Fintech adoption, Operational efficiency, Profitability, Banks resilience.

1. INTRODUCTION

The global crisis has taught us a valuable lesson: excessive emphasis on financial aspects can result in the oversight of social and environmental considerations, leading to failures within the financial system and the emergence of reputation risks. Over the past decade, the banking sector has endeavored to rebuild its reputation by devising a sustainable finance action plan (Agirre-Aramburu & Gomez-Pescador, 2019), complemented by investments in financial technology (Fintech) (Zuo et al., 2021). Implementing sustainability strategies aims to foster the sustainability of the natural environment, human society, and the economy, with anticipated effects on operational efficiency, profitability, and bank resilience. (Nosratabadi et al., 2020).

Through the integration of Fintech, financial institutions can offer cutting-edge services (Tseng & Guo, 2022) encompassing payment systems, electronic money, online loans, big data, blockchain, cloud computing, artificial intelligence, and smart contracts, resulting in significant transformations to banking operations (Zuo et al., 2021). The adoption of Fintech also empowers banks to leverage machine learning algorithms and big data analytics for more effective credit decision-making (Cheng & Qu, 2020) and to employ intelligent investment advisors in guiding investment choices and financial supply chains (Tantri, 2020). Consequently, Fintech presents a formidable challenge for banks to enhance the inclusivity and effectiveness of their control systems and risk management procedures (Weber et al., 2017).

Integrating Fintech into banking strategies introduces additional risks (Sutarti et al., 2019; Helen, 2021; Thakor, 2021). Numerous case studies reveal that a significant number of companies incurred losses during the process of transitioning their information technology (IT) infrastructure. On average, IT project implementations surpass the allocated budget by 27%, with one in six projects experiencing cost overruns of up to 200% (Forbes, 2021). Furthermore, a PwC study examining 10,640 IT projects disclosed that merely 2.5% were completed within the designated timeframe, while the majority still needed to meet objectives and exceed the predetermined budget. These findings underscore that governance issues associated with digital transformation extend beyond the execution phase, presenting a much more intricate challenge (Weinzeimer, 2023, p.15).

Following the recovery from the global crisis in 2010, the financial services sector in Indonesia has established the groundwork for sustainable finance regulations aimed at constructing a corporate sustainability system, which includes the Risk Governance Framework (RGOV) (FSB, 2013; Karyani et al., 2019). This initiative involves the formulation of the Roadmap to Sustainable Finance, expanding information disclosure guidelines associated with the Action Plan on Sustainable Finance (OJK, 2017), and introducing the Green Taxonomy (OJK, 2021). These measures are designed to incentivize structural changes across all industrial sectors and address acute and chronic climate change risks (TCFD, 2021; IFRS, 2021). The financial services sector is anticipated to take the lead in driving the transition toward a low-carbon economic system, accomplishing this through incorporating environmental, social, and governance (ESG) screening in allocating credit and investment (Schoenmaker, 2017).

More empirical research needs to examine the impact of aligning sustainability strategy with IT strategy, except Zuo et al. (2021), who investigated sustainability innovation in commercial banks in China. Their study revealed that investments in digitalization

significantly enhanced production efficiency. This observation aligns with research conducted in Indonesia, where the level of sustainability innovation in the banking sector is moderate. In the initial stages, the banking industry prioritizes a balance between financial, social, and environmental considerations, which may initially have a detrimental effect on profitability. However, operational efficiency positively mediates (Anis et al., 2023). The appropriateness of contextual factors exhibits a favorable impact on performance and serves as a moderating factor in the influence of innovation capability on the performance of strategic business units within the banking sector (Berman, 2012; Anis & Shauki, 2023).

Moreover, statistics from the Ministry of Information of the Republic of Indonesia revealed that 888,711,736 cyber threats were recorded throughout 2020, translating to an average of 42 threats per second (OJK, 2022). The risks associated with digital transformation encompass the potential for personal data breaches and cyberattacks, which can be exacerbated by limited digital technology literacy and uneven infrastructure development (CNBC, 2021). Despite implementing Bank Indonesia Regulation Number 9/15/PBI/2007 and SEOJK Financial Services Authority Circular Letter No.21. 2017 focuses on Commercial Bank IT Risk Management, and the Digital Maturity Assessment for Banks (DMAB) indicates that the maturity level of IT governance within the banking sector in Indonesia remains relatively low at 50%. This level needs to be deemed sufficient to adequately support the transition and sustainability transformation efforts (OJK, 2021).

Studies focusing on digital transformation underscore the significance of strategic alignment, characterized by the appropriate coherence between business strategy and IT strategy (Henderson & Venkatraman, 1999). Nevertheless, there needs to be more consensus among researchers regarding the optimal approach for gauging the impact of digital transformation on company performance (Coltman et al., 2015). Typically, research relies on static alignment models, offering limited practical guidance on enhancing IT-business alignment (Luftman et al., 2017). Studies predominantly conducted in developed nations consistently report a robust correlation between strategic alignment, agility, and overall performance. However, ongoing debate remains concerning the type of alignment that contributes most significantly to performance outcomes (Panda & Rath, 2018; Panda, 2022).

Conversely, studies about sustainability transformation have underscored the substantial costs associated with such initiatives, which can disrupt the operational efficiency of banks (Nidumolu et al., 2009). Despite the costs, sustainability endeavors have been shown to enhance a bank's reputation and decrease capital costs by facilitating more accessible access to funding (Bassen et al., 2020). These initiatives also contribute to fortifying industry standards and elevating competitors' costs (Clarkson et al., 2011). The overarching findings from the research suggest that the positive impacts of sustainability outweigh the negative consequences. Therefore, the hypothesis that sustainable banks are more efficient than conventional banks can be substantiated.

There have been limited studies that explore the profitability of sustainable banking comprehensively (Platovova et al., 2018). Empirical findings suggest that sustainability initiatives contribute to enhanced profitability in banks, with market forces playing a significant role in determining profitability for conventional banks. In contrast, market forces do not exert the same level of influence on the profitability of sustainable banks. Despite increased costs, both conventional and sustainable banks exhibit high profitability.

Consequently, it can be asserted that the market power hypothesis is less relevant in explaining sustainable banks' profitability than conventional banks (Olmo et al., 2021).

Another constraint lies in applying stakeholder, legitimacy, and institutional theory within sustainability research, which has limitations in elucidating the political-economic facets of the sustainability transformation process. In contrast, the examination of the digital transformation process is predominantly conducted in an empirical setting utilizing the Contingency and Diffusion of Innovation theory. However, this approach is constrained to evaluating the interaction of two variables based on managerial selection and a restricted analysis employing a systemic approach. At the practical field level, contemporary literature underscores the emergence of a novel paradigm: strategic IT governance competence 2.0 (ITGOV). This paradigm incorporates the active involvement of top management teams (TMTs) in aligning and spearheading IT project execution (Weinzeimer et al., 2023, p. 19).

The overview above underscores the intricacies of strategy, necessitating a thorough analysis to mitigate insolvency risk, particularly in the financial services sector grappling with substantial losses from credit defaults, elevated uncertainty levels, and constrained funding (Valencia, 2017). This situation holds significant importance as insolvency risk extends beyond individual banks, impacting the entire financial system (Scholten & Klooster, 2019). Aligning sustainability with IT strategies proves instrumental in mitigating the risk of bankruptcy, as it enhances brand image, attracts customers, and diminishes reputation risks (Bassen et al., 2020). Sustainable banks, characterized by transparency and elevated moral standards, are better positioned to alleviate adverse selection and moral hazard concerns (Lopatta et al., 2016). Consequently, the proposition is that sustainable banks have lower risk than conventional banks.

This study aims to bridge the existing research gap by approaching the Analysis through a lens of governance and competence (capability) (Williamson, 1999). Governance challenges top management teams (TMTs) competence in minimizing economic transaction costs by making strategic choices in routine business processes that align with regulations and adhere to standard best practice guidelines (Teece et al., 2007). This research examines the impact of strategic IT governance (ITGOV) competence on banks' resilience, utilizing agility as a proxy for the number of fintech adoptions and operational efficiency. This scrutiny gains significance due to the heightened regulatory environment in responding to financial crises, which prompts investment and adoption of technological innovations influencing operational efficiency. This exploration will unveil distinctions between efficient and inefficient banks (Olmo et al., 2021).

This study introduced the ITGOV Index, formulated by aligning sustainability regulations, risk management, and the COBIT5 standard. Additionally, data on bank ITGOV practices was acquired through content analysis of annual reports. The theoretical frameworks guiding this research encompass New Institutional Economics, Dynamic Capability, Diffusion of Innovation, and Contingency theory. The subsequent sections of the paper are organized as follows: Part 2 delves into the literature review and hypotheses, Part 3 outlines the research methods, Part 4 presents the research results, and Part 5 concludes with insights, implications, limitations, and directions for future research.

2. LITERATURE REVIEW AND HYPOTHESIS

2.1. Theoretical underpinning of strategic IT governance competence 2.0

The New Institutional Economic (NIE) theory, as articulated by Williamson (2000), posits that the pace of organizational adaptation can be assessed within a four-level institutional framework. Firstly, the internalization of social and ethical norms ensures that spontaneous behavior evolves over a timeframe of 100 to 1000 years. Secondly, the state-level institutional environment, with establishing property rights, offers first-order economic opportunities within 10-100 years. Thirdly, if corporations adopt state-level institutions and integrate them into contractual arrangements with stakeholders, it yields second-order economic opportunities within 1-10 years (Williamson, 2022). Lastly, allocating resources and employment, coupled with incentives and rewards, secures profit margins in routine business processes. The speed of adaptation is contingent on causal relationships between institutional levels, with change typically originating from lower to higher institutional levels. However, change is not always positive, as opposing influences between institutional levels can create counteractive effects that impede adaptation (Williamson, 2000).

Dynamic Capability (DC) theory proposes that organizations embrace flexible governance beyond mere legal compliance (Teece et al., 1997). Incorporating digital technology enables organizations to enhance their agility (Cˇirjevskis, 2017), contingent upon IT-business alignment. Agility, viewed as a high-level organizational capability, is systematically cultivated through prolonged learning efforts (Mao et al., 2015). Contrarily, Contingency theory asserts that no one-size-fits-all management system is applicable across all scenarios. Instead, an influential organization fits the contextual factors within its environment (Drazin & Van de Ven, 1985).

A robust risk governance framework (RGOV) plays a pivotal role in risk mitigation, as emphasized in the "Corporate Governance Lessons from the Financial Crisis" (OECD, 2014). RGOV is characterized by the shared responsibility of the board, chief risk officer (CRO), and chief information officer (CIO) in making IT investment decisions and overseeing risks as part of an enterprise-wide management system (Weinzeimer, 2023). A new senior management role has emerged within sustainable companies — the chief sustainability officer (CSO), responsible for spearheading the sustainability transition and transformation. The board of directors (BOD) is responsible for establishing the bank's risk appetite and principles, with support from the Board Risk Management Committee (BRMC), which regularly reports on risk exposure, profile, concentration, and trends. Meanwhile, CROs independently assess credit, market, operational, liquidity, and other key management risks daily (FSB, 2013).

As illustrated in Figure 1, the strategic IT governance competence (ITGOV) model encompasses A) IT Leadership excellence in generating business value through 1) sponsoring IT projects, 2) collaborating with stakeholders, and 3) aligning IT strategy; B) Excellence in executing IT projects by 4) fostering collaboration, 5) optimizing processes, and 6) employing best practice metrics (Weinzimer, 2023). These six domains collectively ensure the efficacy of IT investments (Lee & Mithas, 2008). Organizational (individual) innovativeness, as categorized by the Diffusion of Innovation (DOI) theory, includes the first mover firm (early adopter), the deliberate adopter (early majority), and the skeptical or late majority (laggard firm) (Rogers, 1983; 2004).

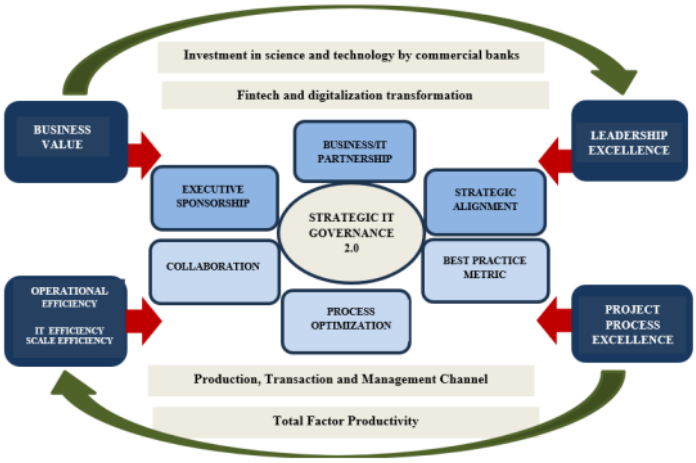

Figure 1. Strategic IT Governance Competence 2.0
Sumber. Diadaptasikan dari (Weinzimer, 2023) dan (Zuo et al., 2021)

Based on the theory, conceptual literature, and prior empirical investigations, the research framework is depicted in Figure 2 below.

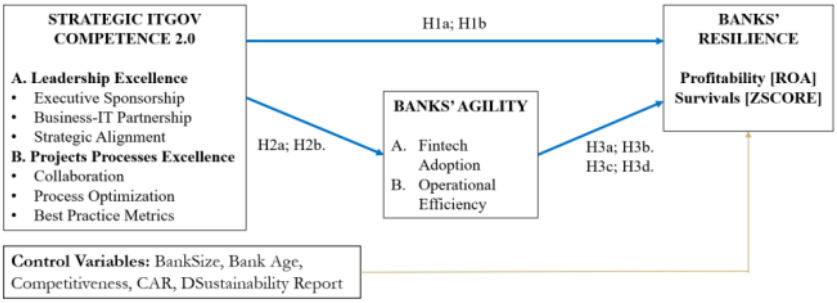

Figure 2. Research framework

2.2. Strategic IT governance competence and banks' resilience

Past studies have identified a positive correlation between IT-business strategic alignment and performance (Panda, 2022) The engagement of top management teams (TMTs) in sponsoring IT projects and aligning strategies has demonstrated efficacy in cost control, profitability enhancement, market growth and the promotion of innovation capabilities (Chan et al., 1997),

Recent investigations have revealed the impact of strategic alignment on corporate agility (Panda & Rath, 2018), positioning it as a precursor to performance (Panda, 2022). According to the dynamic capability theory, corporate agility is considered a high-level capability intentionally developed through long-term learning (Teece, 2007). Strategic ITGOV competence fosters communication and coordination between IT units, departments,

managers, and business executives. This dynamic enhances the quality of decision-making in IT development and related alignment activities. ITGOV is crucial for fostering a robust banking system, a key element in safeguarding sustainable economic growth (Wu et al., 2015). ITGOV competency further leads to collaborative governance and the realization of enhanced IT business value. Recognizing alignment as a dynamic concept necessitates examination from a process-oriented perspective to mitigate risks and sustain profit stability (Tallon, 2008). Based on this rationale, strategic IT governance competence is explored as a construct linked to the learning process, with an anticipated positive impact on banking resilience. This premise forms the basis for the following hypothesis.

H1a. Strategic IT governance competence positively affects banks' profitability.
H1b. Strategic IT governance competence positively affects banks' survival.

2.3. Strategic IT governance competence and banks' agility

In line with the Diffusion of Innovation (DOI) theory, the transformation process unfolds as a protracted learning journey with outcomes realized incrementally through stages (step-by-step innovation model) (Rogers et al., 1983). Effective strategic alignment hinges on knowledge sharing between the top management team and senior IT management, fostering increased coordination and collaboration. This proactive approach enables the top management team to assess the situation before responding to environmental conditions (Barki & Pinsonneault, 2005). Knowledge sharing exemplifies agility in embracing exploitative innovations, enhancing business practices, optimizing product creation costs, and exploring novel services and distribution channels (Lavie & Rosenkopf, 2006; Anis & Shauki, 2023).

A culture of knowledge sharing can be expanded to involve business partners, customers, and suppliers, creating opportunities for IT and business alignment and enriching comprehensive strategic decision-making. Consequently, strategic ITGOV competence nurtures agility, empowering organizations to steer the direction of change. This competency supports top management teams (TMTs) in scanning environmental conditions, encouraging organizations to proactively scale up product and service offerings to address uncertainty. As a result, strategic ITGOV competence promotes efficient resource utilization, enabling the detection and identification of changes (Tallon, 2008). Moreover, ITGOV enhances core business process reengineering capabilities to adapt to change and foresee threats and opportunities. ITGOV develops flexible responses to market changes by concentrating on internal business processes, enhancing operational efficiency, and boosting profits. Hence, the second hypothesis is formulated as follows:

H2a. Strategic ITGOV competence positively affects the adoption of fintech innovation
H2b. Strategic ITGOV competence positively affects banks' operational efficiency

2.4. The mediating role of banks' agility on the relationship between strategic IT governance competence and banks' resilience

To transform into a sustainable bank, top management teams (TMTs) must articulate objectives that consider meeting the needs of local communities, environmental protection, and fostering healthy economic prospects (Boitan, 2018). Attaining this objective involves

TMTs avoiding excessive risk-taking and implementing effective risk-management strategies (Cui et al., 2008). Building positive stakeholder relations becomes instrumental in garnering local support, attracting customers, and mitigating bank risks (Panda & Rath, 2018). Environmentally friendly actions by banks reduce reputation risks and enhance customer loyalty, contributing to funding stability (Bassen et al., 2020).

In a dynamic environment, employees' entrepreneurial spirit determines organizational agility, which is evident in their prompt response to customer requests (Cai et al., 2013). Market capitalization plays a crucial role in decision-making regarding products and services (Panda, 2022), with profitability as a vital indicator of improved performance. Furthermore, organizations endowed with high strategic ITGOV competence can integrate internal resources, modify product and service schemes, and operate more efficiently. Ultimately, strategic alignment enhances customer trust, enabling organizations to navigate market fluctuations, gain competitive advantage, and achieve higher performance.

Aligned with NIE theory, the pace of organizational adaptation is shaped by reciprocal two-way relationships across institutional levels at the country level, organizational governance through performance contractual agreements and resource allocation, and incentive and reward arrangements (Williamson, 2000). In contingency theory, organizational change transpires through collective action, exerting systemic effects on community life. Given the existing research demonstrating the positive impact of fintech adoption on innovation capability (Anis & Shauki, 2023) and agility (Panda, 2022), alongside the mediating role of operational efficiency on profitability (Sutarti et al., 2019; Anis et al., 2023), the ensuing hypothesis is formulated as follows:

H3a. The fintech adoption positively mediates the relationship between strategic ITGOV competence and banks' profitability.

H3b. The fintech adoption positively mediates the relationship between strategic ITGOV competence and banks' survival.

H3c. Banks' operational efficiency positively mediates the relationship between strategic ITGOV competence and banks' profitability.

H3d. Banks' operational efficiency positively mediates the relationship between strategic ITGOV competence and banks' survival.

3. RESEARCH METHODS

3.1. Sample framework and data collection

The research sample comprised 40 banks listed on the Indonesia Stock Exchange spanning 2015 to 2021, constituting 280 bank-years. Indonesia has progressed through Sustainable Finance Journey Phase I (2015-2019) and is presently in Sustainable Financial Journey Phase II, emphasizing the establishment of corporate sustainability systems (CSSs). The anticipation is that strategic ITGOV competence will expedite shifting toward a circular economic system (OJK, 2021).

3.2. Research design and regression model

Three main models were developed to test the following hypotheses

Model 1: Effect of strategic ITGOV competence on banks' resilience

$$ROA_{it} = \alpha_0 + \alpha_1 ITGOV_{it} + \alpha_2 LNSIZE_{it} + \alpha_3 LNAGE_{it} + \alpha_4 CAR_{it} + \alpha_5 CMPT_{it} + \alpha_6 DSR_{it} + \varepsilon$$

$$ZSCORE_{it} = \beta_0 + \beta_1 ITGOV_{it} + \beta_2 LNSIZE_{it} + \beta_3 LNAGE_{it} + \beta_4 CAR_{it} + \beta_5 CMPT_{it} + \beta_6 DSR_{it} + \varepsilon$$

Model 2: The effect of strategic ITGOV competence on banks' agility

$$FINTCH_{it} = \rho_0 + \rho_1 ITGOV_{it} + \rho_2 LNSIZE_{it} + \rho_3 LNAGE_{it} + \rho_4 CAR_{it} + \rho_5 CMPT_{it} + \rho_6 DSR_{it} + \varepsilon$$

$$OPREFF_{it} = \lambda_0 + \lambda_1 ITGOV_{it} + \lambda_2 LNSIZE_{it} + \lambda_3 LNAGE + \lambda_4 CAR_{it} + \lambda_5 CMPT_{it} + \lambda_6 DSR_{it} + \varepsilon$$

Model 3: The mediating role of banks' agility on the relation between strategic ITGOV competence and banks' resilience

$$ROA_{it} = \varphi_0 + \varphi_1 ITGOV_{it} + \varphi_2 FINTCH\_FIT_{it} + \varphi_3 OPREFF\_FIT_{it} + \varphi_4 LNSIZE_{it} + \varphi_5 LNAGE_{it} + \varphi_6 CAR_{it} + \varphi_7 CMPT_{it} + \varphi_8 DSR_{it} + \varepsilon$$

$$ZSCORE_{it} = \pi_0 + \pi_1 ITGOV_{it} + \pi_2 FINTCH\_FIT_{it} + \pi_3 OPREFF\_FIT_{it} + \pi_5 LNSIZE_{it} + \pi_6 LNAGE_{it} + \pi_7 CAR_{it} + \pi_8 CMPT_{it} + \pi_9 DSR_{it} + \varepsilon$$

The hypothesis will be accepted under condition:

H1a,b: α_1: $\beta_1 > 0$; H2a,b: ρ_1:$\lambda_1 > 0$; H3a,b: $\varphi_2, \varphi_3, \pi_2, \pi_3 > 0$

3.3. Operational Variables

The independent variable in this study is the self-constructed ITGOV Index, which serves as a proxy for the maturity level of ITGOV practices. The development of the ITGOV Index assumes that increased regulation will result in the convergence of various governance systems (Salvioni et al., 2016). The ITGOV Index was formulated by mapping sustainability regulations (FSB, 2013; KNKG, 2021; SEOJK No.21. 2017) onto the ITGOV model. Criteria were then developed based on the IT COBIT5 standard. The ITGOV Index emerged from content analysis of information disclosure, encompassing 6 Domains, 18 Subdomains, and 40 ITGOV practice criteria. Scoring was done using the Capability Maturity Grid: Score 1 (Unaware-Undisciplined), Score 2 (Open-minded-Reactive), Score 3 (Widely practiced-Proactive), and Score 4 (Walk the Talk-Enterprise culture). For a detailed overview of the ITGOV development process and criteria, please refer to the following link: [link].

Linkxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

The dependent variable in this study is banks' resilience, gauged through a measure of capital risk-taking, proxied by bank profitability (ROA) and survivals (ZSCORE), indicating a bank's distance from insolvency (Bolton, 2013). ZSCORE is calculated as the return on assets (ROA) plus the capital-to-asset ratio divided by the standard deviation of return on assets (σ(ROA). A higher ZSCORE denotes a more stable financial condition for the bank (Boyd et al., 2006).

The mediating variables include banks' agility, with three proxies: (1) fintech adoption, (2) operational efficiency, and (3) profitability. Fintech adoption involves strategic expenditure with ten criteria: 1) ATMs; 2) SMS banking; 3) EDC electronic payment; 4) Mobile banking; 5) Internet banking; 6) Video banking; 7) Phone banking; and 8) Credit cards (Sutarti et al., 2019), and 9) Enterprise resources planning, 10) Enterprise risk management (Otley, 2016). A bank is assigned a score of 1 for each disclosed fintech adoption criterion, with a total score ranging from 1 to 10. Fintech adoption is measured by the sum of fintech adoption scores divided by the total score and multiplied by 100% (FINTCH ≤ 1).

Operational efficiency is represented by 'technology change,' reflecting a deviation in the non-parallel cost curve that illustrates how the bank minimizes output production costs, adjusts the input mix, and enhances efficiency within a specific technological state.

The measurement of technology change is based on the current technology state (meta frontier) connected to the available best technology set, utilizing the input-output model of intermediary stochastic frontier analysis (SFA) in two stages. The initial step involves calculating operational efficiency as follows:

$$TC_{it} = f^{*}(w_{it}, y_{it}, z_{it})e^{v_{it}+u_{it}} \quad \textbf{(a)}$$

$$LN\_TC_{i,t} = \zeta_0 + \zeta_1 LNFixAsset_{I,t-1} + \zeta_2 LNHrd_{i,t-1} + \zeta_3 LNDeposit_{i,t-1} + \zeta_4 NegEarn_{I,t-1} + \zeta_5 Growth_{i,t} + \zeta_6 CashR_{it} + \zeta_7 DebtR + \zeta_8 EquityR_{it} + \zeta_9 NPL_{it} + \zeta_{10} NIM_{it} + \zeta_{11} FOWN_{it} + \zeta_{12} DDIV_{it} + \zeta_{15} D\_M\&A_{it} + \varepsilon_{it} \quad \textbf{(b)}$$

Where w: input price vector, namely investment in fixed assets and technology, human resources, third party fund savings; y: output vector, namely the amount of financing and investment allocation; z: vector of bank risk profile such as financial conditions (Andries et al., 2016) as well as institutional factors influencing innovation adoption (Zuo et al., 2021) such as foreign-owned banks, bank mergers and acquisitions (Bos et al., 2013); v: random noise iid N (0, σv); μ: inefficiency term N|(μ, σv). The error term eit=mi+ uit describes the overall specific inefficiency. In the second stage, banks functioning on the annual cost frontier, signifying no inefficiency, attain a cost efficiency value 1. In contrast, inefficient banks operate above and below the annual cost frontier, resulting in an efficiency score below 1 (<1). The absolute distance between the annual cost frontier and the meta cost frontier hinges on whether the annual cost frontier surpasses the total cost meta frontier. Technology gap is calculated as GAPit = f meta (wit, yit, zit) / f * meta (wit, yit, zit). Innovation adoption will reduce GAPit due to technological change (meta frontier). Next, to get an interpretation of the direction of the positive influence of strategic ITGOV competence on operational efficiency, the GAPit value is multiplied by minus one (-1).

In the primary model, this study controls bank size represented by the natural logarithm of total assets (LNSIZE), bank age (LNAGE), capital adequacy ratio (CAR) (Karyani et al., 20 , competitiveness level proxied by the Lerner index (CMPT) (Bos et al., 2013), along with a dummy variable set to 1 if the bank issues a sustainability report (DSR).

3.4. Endogeneity issues

This study recognizes endogeneity as a significant governance challenge. Some researchers posit that the governance structure of directors and boards is influenced by past performance (Karyani et al., 2019), while others contend that the governance structure is shaped by dynamic endogeneity factors (Nah et al., 2016). In the banking context, past performance does not dictate future risk governance. The size and composition of the board of directors and commissioners serve as a proxy (Adam & Mehran, 2012), alongside the count of committees and risk management units (Karyani et al., 2019). This research uses two-stage least squares (TSLS) to overcome endogeneity issues.

4. RESULT AND ANALYSIS

4.1. Strategic IT governance competence 2.0 (ITGOV) Index

Before hypothesis testing, the validity and reliability of the ITGOV Index were assessed. Using a significance level of 5% and an r-table of 0.113, all domains, subdomains, and criteria surpassed a value of 0.500, establishing the validity of the ITGOV Index.

Additionally, Cronbach's alpha values for Leadership Excellence (LEAD) and Project Process Excellence (PROJ) were 0.902 and 0.890, respectively. These high values signify that the ITGOV Index is both "valid" and "reliable," affirming its suitability for empirical testing.

4.2. Statistic descriptive and correlation between research variables

Table 1 presents the main variables' mean, standard deviation, and correlations. The mean value for the ITGOV Index is 0.722, with a standard deviation of 0.158, indicating a capability maturity level of 3 (Widely practiced/Proactive). This result suggests a transition towards a higher emphasis on Environmental and Social aspects than Financial aspects, aligning with the shift from Sustainable Finance SF2.0 to 3.0 (Schoenmaker, 2017).

In terms of correlation, ITGOV exhibits a strong positive correlation with FINTCH and a weak positive correlation with OPREFF and CAR. On the other hand, ITGOV demonstrates a strong negative correlation with ROA, ZSCORE, and LNSIZE and a weak negative correlation with LNAGE, CMPT, and DSR.

4.3. Multivariate Testing

Hypothesis testing employs the estimation of a fixed-effect model using panel data. The outcomes of hypothesis testing are outlined in Table 2. Two sensitivity tests were conducted in this study. Firstly, it examines the impact of the ITGOV Domain and Sub-domain on bank agility, specifically fintech adoption, operational efficiency, and profitability. Secondly, assessing the influence of the ITGOV time-lag effect on bank profitability and resilience in years t+1 and t+2.

4.3.1. Analysis of the effect of strategic IT governance competence on banks resilience

The results from Model 1 indicate that strategic ITGOV competence has a negative effect on profitability (ROA) ($\alpha 1$ = -0.799, p-value = 0.091) and on banks' survivals (ZSCORE) ($\beta 1$ = -0.799, p-value = 0.182). Consequently, the hypotheses regarding the influence of ITGOV on bank resilience (H1a and H1b) are not substantiated by the data.

In the sensitivity tests, the negative impact on profitability weakens at t+1 (Coeff = -6.746, p-value = 0.091*) and t+2 (Coeff = -3.543, p-value = 0.251). The influence on banks' survivals varies, showing a positive effect at t+1 (Coeff = 0.967, p-value = 0.035**) and no effect at t+2 (Coeff = 0.080, p-value = 0.453). These results suggest a highly dynamic environmental condition for banks.

Consistent with prior research findings, the adverse effect on profitability may stem from a lack of alignment between IT and business strategy and a mismatch with customer needs (Kearns & Sabherwal, 2007). Furthermore, a low capacity for innovation can lead banks to miss opportunities to enhance efficiency and gain a competitive edge (Oh & Pinsonneault, 2007; Yahya & Hu, 2012). In addition, insufficient attention to security and legal compliance may heighten the risks associated with data security, resulting in financial losses, erosion of customer trust, and legal consequences, which can diminish profitability and reputation, thereby affecting survival (Wu & Shen, 2011).

Table 1. Mean, standard deviation, and correlation between research variables

	Mean	Stdev	ITGOV2.0	FINTCH	OPREFF	ROA	ZSCORE	LNSIZE	LNAGE	ROA_{t-1}	CAR	CMPT	DSR
ITGOV2.0	0.722	0.158	1										
FINTCH	0.784	0.174	0.058**	1									
OPREFF	0.762	0.192	0.042	0.097	1								
ROA	0.004	0.020	-0.081*	0.120	0.093	1							
ZSCORE	3.205	0.206	-0.030*	0.115	0.078	-0.025	1						
LNSIZE	13.500	0.185	-0.125**	0.522***	0.089	0.141**	0.118**	1					
LNAGE	2.637	2.208	-0.002	0.343***	0.031	0.062	-0.048	0.330***	1				
CAR	0.194	0.096	0.006	-0.156***	-0.259	-0.180	0.008	-0.160***	-0.084	0.263	1		
CMPT	0.852	0.249	-0.089	0.270***	0.025	0.046	0.158**	0.579***	0.043	-0.037	-0.133	1	
DSR	0.107	0.09	-0.122	-0.050	-0.019	-0.033	0.075	-0.238***	0.043	0.265***	-111**	0.132**	1

Note(s): ***N=280; *** Significant at 1%; ** 5%; and *10%***
Sources(s) = Data and information analysis from the Annual and Sustainability Report of each bank listed on the Indonesia Stock Exchange (IDX)

Table 2. Regression result model 1 (H1a,b), model 2 (H2a,b) and model 3 (H3a,b,c,d)

Variables	Pred Sign	MODEL 1		MODEL 2		MODEL 3	
		ROA (H1a)	ZSCORE (H1b)	FINTCH (H2a)	OPREFF (H2b)	ROA (H3a;H3b)	ZSCORE (H3c:H3d)
Independent							
ITGOV	+	-0.564 (0.091)	-0.799 (0.182)	**0.254 (0.071)***	**0.073 (0.043**)**	-6.746 (0.051**)	-3.334 (0.102)*
FINTCH_FIT						**0.250 (0.031**)**	**0.450 (0.041)****
OPREFF_FIT						**0.023 (0.09*)**	**0.098 (0.075)***
Control							
LNSIZE	+/-	-0.156 (0.095)	-0.202 (0.101)	0.085 (0.000)***	-0.075 (0.145)**	-0.042 (0.004)	-0.220 (0.082)*
LNAGE	+/-	0.032(0.065)*	0.027 (0.051)**	0.006 (0.001) ***	0.006 (0.053)**	0.002 (0.051)	0.027 (0.004**)
CAR	+/-	6.23 (0.041)**	7.54 (0.045)**	-0.999 (0.022)**	0.204 (0.315)	0.274 (0.256)	8.042 (0.033**)
CMPT	+/-	-0.453 (0.222)	-0.575 (0.242)	-0.275 (0.000)***	-0.275 (0.000)***	-0.121 (0.056)	-0.582 (0.234)
DSR	+/-	0.952 (0.015)**	0.952 (0.0112)**	0.139 (0.001)***	0.135 (0.001)***	0.052 (0.110)	1.012 (0.014**)
N		**280**	**280**	**280**	**280**	**280**	**280**
Adj R - Square		**0.317**	**0.336**	**0.649**	**0.646**	**0.173**	**0.336**
F-statistic		**4.643**	**4.532**	**13.780**	**13.784**	**3.480**	**4.457**
Prob (F-statistic)		**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Note(s): ***N=280 Significant at 1%; ** 5%; and *10%***
Sources(s) = Data and information analysis from the Annual and Sustainability Report of each bank listed on the Indonesia Stock Exchange (IDX

Table 3. Sensitivity analysis - the effect of domain and sub-domain of ITGOV on banks' agility and resilience at t+1 and t+2

	Pred Sign	BANKS' AGILITY				BANKS' RESILIENCE			
		FINTCH t+1		OPREFF t+1		ROA t+1	ROA t+2	ZSCORE t+1	ZSCORE t+2
Independent						**ROA t+1**	**ROA t+2**	**ZSCORE t+1**	**ZSCORE t+2**
ITGOVX	(+)					-6.746 (0.091*)	-3.543 (0.251)	**0.967 (0.035**)**	0.080 (0.453)
SPONSOR	(+)	0.049 (0.390)		-0.077 (0.132)					
PARTNER	(+)	-0.083 (0.270)		0.075 (0.302)					
ALIGNM	(+)	-0.458 (0.002**)		-1.146 (0.181)					
LEADER	(+)		-0.146 (0.023**)		-0.308 (0.033**)				
COLLAB	(+)	**0.237 (0.085*)**		**0.255 (0.072*)**					
OPTIMIZ	(+)	**0.208 (0.035**)**		**0.004 (0.021**)**					
METRIC	(+)	0.002 (0.410)		-0.004 (0.302)					
PROJECT			**0.386 (0.004**)**		**0.223 (0.062*)**				
Control									
LNSIZE	(+/-)	0.082 (0.000***)	0.086 (0.000)	-0.040 (0.001***)	-0.039 (0.015**)	0.007 (0.004**)	-0.005 (0.015**)	0.155 (0.201)	0.080 (0.450)
LNAGE	(+/-)	0.005 (0.000***)	0.005 (0.003**)	-0.041 (0.010)	-0.03 (0.090*)	-0.003(0.027**)	0.062 (0.361)	0.040 (0.014**)	0.012 (0.241)
CAR	(+/-)	0.562 (0.031**)	0.426 (0.061*)	0.651 (0.032**)	0.228 (0.302)	0.023 (0.064*)	-0.033 (0.035**)	0.878 (0.341**)	2.068 (0.111*)
CMPT	(+/-)	-0.261(0.007***)	-0.274(0.000***)	-0.114 (0.131)	-0.119 (0.054)	0.026(0.000***)	-0.019 (0.012)	0.255 (0.352)	-0.596 (0.191)
DSR	(+/-)	0.154 (0.000***)	0.139 (0.001***)	0.045 (0.140)	0.044 (0.142)	0.093 (0.065*	0.007 (0.113)	0.174 (0.370)	0.618 (0.122)
1		**240**	**240**	**240**	**240**	**240**	**200**	**240**	**200**
Adj R - Square		**0.882**	**0.657**	**0.186**	**0.175**	**0.559**	**0.624**	**0.341**	**0.149**
3 Statistic		**35.697**	**14.890**	**24.987**	**23.675**	**69.665**	**58.873**	**28.452**	**6.809**
Prob (F. Statistic)		**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Note(s): ****Significant at 1%; ** 5%; and *10%*
Sources(s) = Data and information analysis from the Annual and Sustainability Report of each bank listed on the Indonesia Stock Exchange (IDX)

Additionally, adverse consequences may arise from the mismanagement of IT projects, encompassing cost, time, and quality issues, leading to implementation failures with potentially harmful ramifications. Project management errors can further impact resilience, making it challenging to adapt to changes or market pressures (Berman, 2012). There needs to be more planning and testing of disaster recovery strategies to increase the likelihood of data loss and unproductive downtime, impeding the business's capacity to operate seamlessly in the aftermath of unforeseen events (Panda & Rath, 2018).

Inadequate IT governance may lead to uncontrolled operational costs, such as a lack of control over IT resources, suboptimal vendor relationship management, or inefficient excess capacity, negatively impacting profitability. Simultaneously, the escalating regulatory demands challenge banks to adapt costly governance structures to accommodate TMTs' competence that aligns with regulatory requirements. The findings affirm the Dynamic Capability theory, asserting that achieving resilience in banks necessitates strategic IT governance competence developed and integrated in a planned manner (Teece et al., 1997) within a long-term learning system (Chan et al., 1997). IT governance is pivotal for sustaining a healthy banking system, serving as a cornerstone for safeguarding sustainable economic growth (Wu & Shen, 2011).

4.3.2. Analysis of the effect of strategic ITGOV competence on banks' agility

The findings from hypothesis testing in Model 2 reveal that strategic IT governance competence positively influences fintech adoption (FINTCH) ($\rho 1$=0.254, p-value=0.071) and operational efficiency (OPREFF) ($\lambda 1$= 0.073, p-value=0.043**), supporting the hypotheses regarding the impact of ITGOV on bank agility (H2a and H2b).

The sensitivity test indicates that the positive effect on banks' agility stems from the opposing influence of the IT Leadership (LEAD) domain, which negatively impacts fintech adoption (Coeff= -0.146, p-value=0.023) and operational efficiency (Coeff= -0.308, p-value 0.033). Conversely, the IT Project Execution (PROJECT) domain exerts a positive effect on fintech adoption (Coeff=0.386, p-value=0.004**) and operational efficiency (Coeff=0.223, p-value=0.062*).

Moreover, the sensitivity test reveals that Executive Sponsorship and IT-business partnership have no effects, and even strategic IT-business alignment has a negative effect. However, this negative effect is offset by the positive impact of collaboration and process optimization, while best-practice metrics show no effect. These findings align with prior research emphasizing the vital role of IT Leadership, led by the Top Management Team (TMT), in establishing strategic priorities for effective resource allocation to support the adoption of relevant Fintech, positively impacting operational efficiency (Barki & Pinsonneault, 2005; Thakor, 2020; Carney, 2021; Helen, 2021).

The significance of IT Leadership extends to ensuring the integration of IT systems and architecture, involving developing and maintaining a cohesive IT architecture. Leadership Excellence in IT ensures seamless integration of bank information systems and applications with fintech adoption solutions, considering regulatory compliance and information security risks (Wu & Shen, 2011; Panda & Rath, 2018; Panda, 2022).

In IT Project Execution, banks' adaptability to environmental changes is paramount. Excellence in IT Project Execution empowers banks to adapt to necessary operational

changes swiftly, leveraging new features for heightened operational efficiency, thereby averting resource wastage and project delays (Berman, 2012). This mechanism engages key stakeholders in decision-making to ensure that fintech adoption aligns with strategic objectives and supports operational efficiency (Panda & Rath, 2018).

The research findings align with the Diffusion of Innovation theory, emphasizing that the digital transformation process is a prolonged learning process with outcomes realized gradually (step-by-step innovation model) (Rogers et al., 1983). Through optimizing strategic IT governance competence, banks can maximize their potential for adopting fintech innovations and optimize overall operations (Berman, 2012).

4.3.3. Analysis of the mediating role of banks' agility on the relationship between strategic IT governance competence and bank resilience.

The results of hypothesis testing for model 3, examining the mediating role of banks' agility in the impact of strategic ITGOV competence on bank resilience, indicate that fintech adoption (FINTCH) positively mediates the influence of ITGOV on profitability (ROA) ($\varphi 2=0.250$, p-value=0.031**) and survivals (ZSCORE) ($\pi 2=0.450$, p-value=0.041**). Additionally, operational efficiency affects profitability ($\varphi 3=0.023$, p-value=0.09*) and survival ($\pi 3=0.098$, p-value=0.075*). Thus, the data substantiates the hypothesis proposing the mediating role of banks' agility in the relationship between strategic ITGOV competence and bank resilience.

The research findings are consistent with prior studies, indicating that adopting Fintech, encompassing process automation, enhanced risk management, and the advancement of digital services, can directly enhance operational efficiency and business resilience. This situation is achieved through diversifying services like mobile banking, digital payments, and peer-to-peer lending (Zuo et al., 2021). The diversification of services contributes to bolstering the bank's resilience against economic risks and market fluctuations. Effective IT governance is crucial in aiding banks in strategically designing and managing this diversification of services (Thakor, 2021). Fintech adoption is a valuable tool for banks in improving risk management practices through advanced data analysis, artificial intelligence, and real-time monitoring.

Strategic ITGOV competence ensures banks establish robust information security infrastructure and policies, enhancing effective risk management and fortifying resilience against security threats (Cheng & Qu, 2020). Fintech adoption empowers banks to enhance the availability and affordability of their financial services. By leveraging Fintech, banks can respond promptly to evolving market dynamics and changing customer needs. Effective IT governance is pivotal in expediting decision-making processes and facilitating the swift implementation of technological changes necessary for maintaining competitiveness. The capacity to adapt rapidly contributes to elevating a bank's resilience in the face of fluctuations in the business environment.

In light of the details above, the results align with the NIE theory, suggesting that the organizational pace of adaptation is shaped by reciprocal relationships between institutional levels at the national scale, organizational governance through performance contracts, and the allocation of resources, incentives, and rewards (Williamson, 2000). Fintech adoption and operational efficiency connect strategic ITGOV competence with bank resilience,

empowering banks to respond more to change and enhance resilience in confronting external challenges.

The findings from the control variable tests reveal that bank size exerts a negative influence on both profitability and survival. Conversely, bank age and capital adequacy ratio exhibit a positive effect, while banks publishing sustainability reports demonstrate higher profitability and survival than those not. The competitiveness level, however, needs to show more impact on bank resilience. The sensitivity test results at t+1 and t+2 indicate an attenuation of the negative influence and an augmentation of the positive influence, suggesting an enhancement in strategic IT governance competence over time.

5. CONCLUSION, IMPLICATION, LIMITATION AND FUTURE STUDIES

This study seeks to assess sustainability strategies through the lens of strategic IT governance competence. More precisely, it introduces the Information Technology Governance Index (ITGOV) as a representative measure for the strategic IT governance competence of banks listed on the Indonesia Stock Exchange (BEI) during the period 2015-2021 (280 banks-year). Subsequently, the research evaluates the impact of the ITGOV Index on bank resilience, gauged by banks' profitability (ROA) and survival (ZSCORE), through the prism of banks' agility proxied by fintech adoption and operational efficiency proxies.

The research results show an increase in the banking ITGOV Index in Indonesia during the observation period. Empirical test results show that ITGOV negatively impacts bank resilience, reducing profitability and survival. However, this negative effect diminishes with the increase in risk governance structure and ITGOV at t+1 and t+2. Strategic IT governance competence positively affects the adoption of fintech innovations and the operational efficiency of banks. This positive effect stems from various regulations affecting the domains and subdomains of banks' strategic IT competencies. Within the Leadership Excellence domain, Executive sponsorship and IT-business partnerships do not impact banks' agility, while Strategic IT-business alignment has a negative effect.

Nevertheless, the negative effect is offset by the growing competence in IT project execution, where the IT-business collaboration and process optimization subdomain positively influence bank agility. However, the best-practice metrics subdomain has no effect. Furthermore, banks' profitability and operational efficiency (banks' agility) mediate between ITGOV and bank resilience. The research findings align with new institutional economics (NIE), dynamic capability (DC), diffusion of innovation (DOI), and Contingency theory. The study offers practical implications for the banking sector in digital transformation and sustainability, along with recommendations for reinforcing ESG practices and risk governance frameworks to expedite the transition to a low-carbon economy.

The study is subject to certain limitations, and avenues for future research are suggested. Firstly, the testing scope is confined to the banking sector in Indonesia, prompting a recommendation for broader testing within the non-financial industrial sector across different countries. Secondly, the ITGOV Index was exclusively developed through content analysis of seven-year annual reports. Future studies could incorporate longitudinal data and integrate interview procedures to understand companies' ITGOV practices better.

Acknowledgment

This research was presented at the 8th International Social Science Congress, Theme: Interconnected Future; Navigating the Global Challenges on 16 – 17 December 2023. The CEO of the International Congress Communication Economics Organization, IPMI International Business School, and Politecnico De Portalegre hosted the event. This research is the flagship research of the Faculty of Economics and Business, Trisakti University, and is included in the Trisakti Governance Center Study Center group. We would like to thank Prof. Astri Rinanti, Director of the Institute for Research and Community Service (LPPM Institute) at Trisakti University, who has provided funding support for the implementation and publication of the results of this research https://lppm.trisakti.ac.id/

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