West Science Information System and Technology
Vol. 3, No. 02, August 2025, pp. 141~150

Empirical Study of Information Systems Risk Management in Technology Startups in Indonesia

Faiz Muqorrir Kaaffah[1], Karnoto[2], Bambang Winardi[3]
[1]UIN Siber Syekh Nurjati Cirebon
[2,3]Diponegoro University

Article Info

Article history:

Received August, 2025
Revised August, 2025
Accepted August, 2025

Keywords:

Information System Risk Management,
IT Governance,
Digital Innovation,
Startup Performance,
SEM-PLS

ABSTRACT

This study investigates the influence of Information System Risk Management (ISRM) and IT Governance on the performance of technology startups in Indonesia, with Digital Innovation serving as a mediating variable. A quantitative approach was employed, collecting data from 140 respondents using a 5-point Likert scale questionnaire. The data were analyzed using Structural Equation Modeling-Partial Least Squares (SEM-PLS 3). The results indicate that both ISRM and IT Governance have significant positive effects on digital innovation, which in turn positively impacts startup performance. Additionally, digital innovation partially mediates the relationship between ISRM, IT Governance, and startup performance. These findings highlight that effective risk management and IT governance, combined with digital innovation, are essential for enhancing the performance and competitiveness of technology startups in Indonesia.

Corresponding Author:

Name: Faiz Muqorrir Kaaffah
Institution: UIN Siber Syekh Nurjati Cirebon
Email: faiz@syekhnurjati.ac.id

1. INTRODUCTION

In the rapidly evolving digital era, technology startups have become a significant driver of economic growth and innovation in Indonesia, operating in a highly dynamic and competitive environment where the effective management of information systems and IT resources is critical to achieving sustainable performance. Information System Risk Management (ISRM) and IT Governance have emerged as essential mechanisms to ensure that technology resources are utilized efficiently, risks are mitigated, and strategic objectives are achieved. ISRM focuses on identifying, assessing, and controlling risks related to information systems, which can threaten the continuity and reliability of business operations, while IT Governance ensures that IT aligns with organizational goals, supports decision-making, and enhances value creation. Risk mitigation is vital for startups to manage threats such as cybersecurity, regulatory compliance, and operational inefficiencies that are prevalent in the IT industry [1], whereas strategic alignment ensures that IT resources are directed toward business objectives, thereby enhancing value creation [1]. However, startups face regulatory complexities and market uncertainties that necessitate robust risk management and governance frameworks [2], [3], alongside challenges such as talent shortages and limited technological resources, which demand effective

management strategies [1]. Despite these challenges, opportunities for growth exist, particularly through embracing digital transformation to innovate and adapt to changing market demands, thereby leveraging technologies to gain competitive advantages [4], as well as through collaborative ecosystems where partnerships with other startups, industry players, and government bodies provide access to resources, knowledge, and new markets [4].

Despite the growing importance of ISRM and IT Governance, many technology startups in Indonesia face challenges in implementing these practices due to limited resources, rapid technological changes, and evolving regulatory environments. One-way startups can address these challenges is through digital innovation, which involves adopting new digital technologies, processes, and business models to improve products, services, and operations. Digital innovation acts as a mediator by translating robust risk management and governance practices into tangible performance outcomes, enabling startups to overcome resource limitations, adapt to rapid technological shifts, and comply with evolving regulatory demands. Moreover, digital innovation, when combined with financial governance, significantly enhances investor trust, a factor shown to account for 62% of the variance in investor confidence in Yogyakarta, thereby underscoring its critical role in fostering startup growth and sustainability [5]. Startups also face internal challenges such as leadership and team dynamics, as well as external issues like funding and regulatory pressures, and digital innovation helps mitigate these by improving management practices and market adaptability, thus reducing the risk of failure [3]. In addition, the Indonesian government and private sector initiatives provide essential support through policies and investments that can be leveraged by startups to strengthen their digital capabilities and governance practices [5]. Finally, digital entrepreneurship enables startups to enhance operational efficiency, expand market reach, and develop competitive advantages through the integration of technologies such as e-commerce platforms and AI, which further bolster adaptability and long-term sustainability [6].

Previous studies have highlighted the positive effects of ISRM and IT Governance on organizational performance across various industries; however, research focusing on technology startups, particularly in the Indonesian context, remains limited, making it crucial to understand how digital innovation mediates this relationship to provide valuable insights for startup managers, investors, and policymakers in enhancing competitiveness and sustainability. Digital innovation plays a pivotal role in bridging ISRM, IT Governance, and organizational performance, especially for Indonesian technology startups operating in dynamic and competitive environments, as it improves operational efficiency, market reach, and investor trust. Evidence from Yogyakarta shows that digital innovation, together with financial governance, accounts for 62% of the variance in investor trust, underscoring its importance in fostering investor confidence [5]. Furthermore, technology orientation has been shown to positively impact entrepreneurial orientation, which subsequently enhances innovation performance, a relationship particularly significant for startups in emerging economies like Indonesia that must adopt proactive and inventive practices to keep pace with technological advancements [7]. The adoption of digital technologies such as AI, data analytics, and platform-based solutions has also been found to positively affect business performance by improving efficiency and expanding market reach, with sectors such as fintech, edutech, and healthcare experiencing significant growth in both users and revenue [8]. Nevertheless, challenges persist, including cybersecurity threats, the digital divide, and intense marketing competition, all of which necessitate strong governance and policy support, with government initiatives playing a critical role in fostering a supportive digital

ecosystem that enables startups to overcome barriers and sustain innovation [5], [8].

Based on these considerations, this study aims to investigate the influence of Information System Risk Management and IT Governance on the performance of technology startups in Indonesia, with digital innovation serving as a mediating variable. By employing a quantitative approach with SEM-PLS analysis, this research seeks to offer empirical evidence that can guide strategic IT management and innovation practices within the startup ecosystem.

2. LITERATURE REVIEW

2.1 Information System Risk Management (ISRM)

Information System Risk Management (ISRM) is crucial for technology startups that often operate under resource constraints and high uncertainty, as effective ISRM practices enable them to protect digital assets, ensure data integrity, and minimize operational disruptions while enhancing performance and stakeholder trust. To achieve this, startups must integrate risk identification and analysis into every business decision by categorizing, communicating, and measuring risks effectively (Johnson et al., 2009), supported by a continuously evolving assessment process to address internal and external threats and safeguard assets and operations [9]. An effective ISRM framework should also include information acquisition, analysis, and risk assessment modules to identify and predict future risks, with historical assessments providing insights into patterns and preventive measures [10]. Moreover, startups should implement a comprehensive risk management life cycle encompassing threat identification, risk analysis, and mitigation strategies, prioritizing high-severity risks over low-severity ones to maximize efficiency given their limited resources [11]. Nonetheless, startups face serious challenges such as targeted attacks and operational disruptions that threaten information confidentiality, integrity, and availability [12], making it essential to consider emerging trends in IT risk management, including cognitive technologies and behavioral sciences, to strengthen and modernize risk management processes [11].

2.2 IT Governance

IT Governance is crucial for technology startups as it provides a structured framework to align IT strategy with business objectives, ensuring that IT investments deliver maximum value while fostering innovation, efficiency, and competitiveness through decision-making, resource management, performance measurement, and risk oversight. Strategic alignment ensures IT initiatives are consistent with organizational goals, creating synergy and goal congruence [13], [14]. IT Governance also emphasizes value creation, where business/IT alignment drives innovation in products, services, and processes [15], transforming IT into a strategic partner rather than just a service provider [16]. A robust framework further integrates risk management and compliance through standards like COBIT, ITIL, and ISO/IEC 27001 to mitigate risks and protect sensitive data [13], while balancing risk and return to optimize investments [17]. Finally, performance measurement ensures accountability and transparency, with clear roles and responsibilities to ensure IT resources effectively support enterprise goals [13].

2.3 Digital Innovation

Digital innovation is a transformative process that leverages digital technologies to create or enhance products, services, processes, or business models, significantly shaping how startups operate and compete by improving efficiency, enhancing customer engagement, and supporting long-term growth. Acting as a mediator between IT capabilities and organizational performance, digital innovation translates IT investments into measurable business outcomes, enabling startups to remain competitive and responsive to market demands. It takes several forms: digital product innovation, which creates or improves offerings to boost

customer satisfaction; digital process innovation, which enhances internal efficiency and reduces costs; and digital business model innovation, which develops new ways of creating value and achieving competitive advantage [18]. Embedding digital innovation requires a framework of technology-driven development, enablers, and governance structures, all of which must be aligned with organizational strategies and capabilities to succeed [19]. Ultimately, digital innovation enhances organizational performance by enabling startups to meet customer needs quickly, explore new opportunities, and translate IT investments into tangible business outcomes [20], [21].

2.4 Startup Performance

Innovation, risk management, and IT-related capabilities are pivotal in enhancing startup performance, as they allow startups to navigate competitive markets, manage uncertainties, and leverage technology for growth. Innovation enables startups to create unique value propositions, adapt to market changes, and attract investment, with process and incremental innovations proving particularly effective in improving survival rates, while product and radical innovations may carry higher risks due to increased liabilities [22], [23]. Effective risk management practices, such as conducting market research and product testing to ensure product–market fit and regulatory compliance, alongside building financial reserves and adopting flexible organizational structures, help startups mitigate risks and respond effectively to dynamic environments [24]. At the same time, IT-related capabilities play a crucial role by enabling efficient operations and data-driven decision-making, both of which are essential for scaling and sustaining growth [25], while lean startup management practices such as optimal pivoting and professionalized HR policies are linked to stronger growth in seed equity valuation [26].

2.5 Research Hypotheses

Based on the literature, the following hypotheses are proposed:

H1: Information System Risk Management positively influences digital innovation.

H2: IT Governance positively influences digital innovation.

H3: Digital innovation positively influences startup performance.

H4: Information System Risk Management positively influences startup performance.

H5: IT Governance positively influences startup performance.

H6: Digital innovation mediates the relationship between ISRM and startup performance.

H7: Digital innovation mediates the relationship between IT Governance and startup performance.

3. METHODS

3.1 Research Design

This study employs a quantitative research design to examine the influence of Information System Risk Management (ISRM) and IT Governance on the performance of technology startups in Indonesia, with digital innovation as a mediating variable. Quantitative analysis is appropriate for this research because it allows for testing hypotheses and establishing relationships between variables using statistical methods. Structural Equation Modeling-Partial Least Squares (SEM-PLS 3) is employed to analyze the data, as it is suitable for complex models with multiple variables and mediating effects.

3.2 Population and Sample

The population of this study consists of technology startups in Indonesia across sectors such as fintech, e-commerce, health-tech, and software development, with a total of 140 respondents selected through purposive sampling based on three criteria: the respondent is directly involved in IT management or decision-making within the startup, the startup has been operational for at least two years, and the startup actively engages in digital innovation initiatives.

3.3 Data Collection

Data were collected using a structured questionnaire with closed-ended questions measured on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree), which was divided into four sections corresponding to the research variables:

Information System Risk Management (ISRM), measured through indicators such as risk identification, risk analysis, risk control, and monitoring; IT Governance, measured through indicators including strategic alignment, value delivery, resource management, and performance monitoring; Digital Innovation, measured through indicators such as adoption of digital technologies, process innovation, product/service innovation, and business model innovation; and Startup Performance, measured through indicators including financial performance, market growth, customer satisfaction, and operational efficiency.

3.4 Data Analysis

The collected data were analyzed using Structural Equation Modeling-Partial Least Squares (SEM-PLS 3) through several procedures, including descriptive statistics to present respondent demographics and response distributions for each variable; validity and reliability testing to ensure measurement accuracy, where convergent validity is confirmed with factor loadings greater than 0.7, and reliability is assessed using composite reliability (CR > 0.7) and average variance extracted (AVE > 0.5); path analysis to examine the direct and indirect effects of ISRM and IT Governance on startup performance with digital innovation as a mediating variable, where significance is evaluated using t-statistics greater than 1.96 at a 95% confidence level; and mediation analysis to identify the role of digital innovation in translating ISRM and IT Governance into improved startup performance.

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

Descriptive statistics were conducted to provide an overview of the respondents and the distribution of responses for each variable in the study, with data collected from 140 respondents representing technology startups in Indonesia. The respondent profile shows that 60% were male and 40% female, with the majority (55%) aged between 25–35 years, 30% between 36–45 years, and 15% above 45 years. In terms of organizational roles, 70% held managerial positions related to IT or digital innovation, 20% were team leaders, and 10% were staff members directly involved in IT operations. Regarding education, 65% of respondents held a bachelor's degree, while 35% had postgraduate qualifications.

The measurement of research variables was conducted using a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The mean scores for each variable were as follows: Information System Risk Management (ISRM) 4.12 (high), IT Governance 4.05 (high), Digital Innovation 4.20 (high), and Startup Performance 4.08 (high). These results indicate that respondents generally perceive their startups to have strong ISRM and IT Governance practices, while also actively implementing digital innovation activities. The relatively high perception of startup performance further suggests that technology startups in Indonesia maintain moderate to high levels of risk management, governance, and innovation, providing a strong foundation for analyzing the relationships among these variables.

4.2 Validity and Reliability Testing

4.2.1 Convergent Validity

Convergent validity was assessed using factor loadings and Average Variance Extracted (AVE), where Hair et al. (2022) suggest that factor loadings should exceed 0.7 and AVE should be greater than 0.5 to indicate adequacy. The results showed that Information System Risk Management (ISRM) had indicator loadings between 0.742 and 0.876 with an AVE of 0.611, IT Governance had loadings ranging from 0.756 to 0.882 with an AVE of 0.624, Digital Innovation had loadings between 0.768 and 0.895 with an AVE of 0.639, and Startup Performance had loadings ranging from 0.734 to 0.867 with an AVE of 0.605. Since all factor loadings exceeded 0.7 and all AVE values were above 0.5, convergent validity was confirmed for all constructs.

4.2.2 Reliability Testing

Reliability was measured using Composite Reliability (CR) and Cronbach's Alpha, with values above 0.7 considered acceptable (Hair et al., 2022). The results showed that Information System Risk Management (ISRM) had a CR of 0.891 and Cronbach's Alpha of 0.864, IT Governance had a CR of 0.898 and Cronbach's Alpha of 0.872, Digital Innovation had a CR of 0.906 and Cronbach's Alpha of 0.879, and Startup Performance had a CR of 0.882 and Cronbach's Alpha of 0.851. Since all variables demonstrated CR and Cronbach's Alpha values greater than 0.7, the constructs were confirmed to be highly reliable and consistent.

The results of the validity and reliability tests indicate that the measurement model is both valid and reliable, as the indicators accurately represent their respective constructs and the responses show consistency. This ensures that the model provides a strong foundation for further analysis, supporting the robustness of the structural model and hypothesis testing.

4.3 Structural Model (Regression Analysis)

The structural model analysis was conducted using SEM-PLS 3 to examine the hypothesized relationships among Information System Risk Management (ISRM), IT Governance, Digital Innovation, and Startup Performance, with the evaluation focusing on path coefficients, t-statistics, p-values, and R^2 values to determine the significance and strength of the relationships, and the results of this structural model are summarized in the following table.

Table 1. Hypothesis Testing

Hypothesis	Path	β Coefficient	t-Statistic	p-Value	Result
H1	ISRM → Digital Innovation	0.612	7.854	0.000	Supported
H2	IT Governance → Digital Innovation	0.658	8.213	0.000	Supported
H3	Digital Innovation → Startup Performance	0.701	9.412	0.000	Supported
H4	ISRM → Startup Performance	0.415	4.873	0.000	Supported
H5	IT Governance → Startup Performance	0.472	5.268	0.000	Supported
H6	ISRM → Digital Innovation → Performance	0.429	5.615	0.000	Supported (Partial Mediation)

The results of hypothesis testing show that Information System Risk Management (ISRM) has a strong positive relationship with digital innovation (H1, β = 0.612), indicating that startups with better risk management practices are more likely to implement effective digital innovations. Similarly, IT Governance significantly supports the development of digital innovation (H2, β = 0.658), while digital innovation itself strongly influences startup performance (H3, β = 0.701), confirming its role as a key driver of operational and market success. Both ISRM (H4, β = 0.415) and IT Governance (H5, β = 0.472) also have direct positive effects on startup performance, which demonstrates that risk management and governance practices contribute to business outcomes independently of their influence on innovation. Furthermore, the mediation analysis (H6 & H7) indicates that digital innovation partially mediates the relationship between ISRM, IT Governance, and startup performance, showing that while ISRM and IT Governance directly enhance performance, their full potential is best realized when channeled through innovative initiatives.

The coefficient of determination (R^2) further supports these findings, with digital innovation having an R^2 value of 0.628, meaning that 62.8% of its variance is

explained by ISRM and IT Governance, while startup performance achieved an R^2 value of 0.715, indicating that 71.5% of its variance is explained collectively by ISRM, IT Governance, and digital innovation. These high R^2 values suggest that the structural model has strong explanatory power, confirming that ISRM and IT Governance, with digital innovation acting as a mediator, are critical determinants of startup performance in the Indonesian technology sector.

4.4 Discussion

4.4.1 The Role of ISRM

The findings indicate that ISRM has a significant positive effect on digital innovation ($\beta = 0.612$, $t = 7.854$) and startup performance ($\beta = 0.415$, $t = 4.873$), supporting prior research that effective risk management ensures system reliability, safeguards data, and minimizes operational disruptions, thereby creating a secure environment for implementing innovative digital solutions. Technologies such as big data, predictive analytics, IoT, and AI play a vital role in identifying, analyzing, and mitigating risks, enabling startups to monitor threats efficiently and respond proactively, while integrated risk management systems strengthen their ability to address risks comprehensively and support adaptive business models [27]. In practice, startups often focus on risk identification and monitoring, employing strategies like developing a Minimum Viable Product (MVP) and executing pivots to manage technical and business risks [28]. A structured risk management process that incorporates assessment and mitigation is crucial for balancing innovation with risk control [29], as effective risk management not only minimizes threats but also stimulates creativity, thereby enhancing long-term competitiveness. Proactive and reactive approaches such as risk assessments and agile methodologies are also essential in managing uncertainties in digital projects, further improving innovation outcomes [30]. For technology startups operating in uncertain and rapidly changing markets, strong ISRM practices thus serve as a foundation for mitigating risks associated with technology adoption, allowing them to pursue innovation with greater confidence.

4.4.2 The Role of IT Governance

IT Governance shows a significant positive impact on digital innovation ($\beta = 0.658$, $t = 8.213$) and startup performance ($\beta = 0.472$, $t = 5.268$), reinforcing the view that aligning IT strategy with business objectives, managing IT resources effectively, and monitoring performance are critical for achieving organizational goals. In Indonesian companies, including state-owned enterprises, IT governance emphasizes performance management, value delivery, and strategic alignment, with frameworks such as COBIT 2019 widely used to assess governance effectiveness and align IT strategies with business goals [31], [32]. Strategic alignment models like the Strategic Alignment Model (SAM) further ensure IT and business strategies remain synchronized, contributing to better organizational performance [33]. Supporting factors such as management commitment, vision and mission alignment, and partnerships are also essential in fostering IT-business synergy, while the empowerment and utilization of IT capabilities alongside business strategies enhance competitiveness and organizational success [33], [34]. Nevertheless, challenges in implementing IT governance and achieving alignment persist, particularly due to cultural and geographical differences, indicating the need for further research to optimize governance frameworks in Indonesian startups [32]. In this context, structured IT governance ensures that digital initiatives are strategically planned and effectively executed, thereby improving both innovation capacity and overall startup performance.

4.4.3 Digital Innovation as a Mediator

Digital innovation significantly mediates the relationship between ISRM, IT Governance, and startup performance (H6 and H7 supported), indicating that while ISRM and IT Governance directly enhance performance, their full potential is realized when translated into innovative digital solutions that improve processes, products,

and business models. Startups that actively adopt digital technologies are better positioned to achieve superior market growth, operational efficiency, and customer satisfaction, as digital technology adoption has been shown to improve innovation performance through the firm's knowledge base and technological capability [35]. The integration of platforms such as AI and data analytics drives substantial growth in users and revenue, underscoring the impact of digital adoption on business success [8]. In this context, IT governance models are evolving to support digital transformation by shifting from traditional IT support roles toward strategic partnerships, making IT more business-aware and fostering cross-functional learning [36], while aligning IT and business strategies with social innovation further enhances performance [37]. For startups, successful digital transformation requires agile methodologies, digital literacy, and customer-centric innovation, with emerging technologies like AI and blockchain acting as key enablers of efficiency and competitiveness, while navigating regulatory landscapes and cultivating innovation cultures remain essential to sustaining long-term growth [38].

4.4.4 Implications for Startup Management

The findings underscore the strategic importance of integrating risk management, IT governance, and digital innovation in technology startups. Managers should invest in robust risk assessment frameworks, align IT governance structures with strategic goals, and foster a culture that encourages digital experimentation. By doing so, startups can leverage technology not only to manage risks and resources effectively but also to create value through continuous innovation.

5. CONCLUSION

This study provides empirical evidence that ISRM and IT Governance are critical determinants of the performance of technology startups in Indonesia, as both constructs not only directly improve performance but also foster digital innovation, which serves as a mediator to enhance overall outcomes. ISRM ensures system reliability and effective risk mitigation, allowing startups to confidently pursue innovative digital solutions, while IT Governance aligns IT resources with strategic objectives, enabling the effective execution of digital initiatives. Digital Innovation, in turn, plays a pivotal role in translating robust risk management and governance practices into tangible performance gains, including operational efficiency, market growth, and customer satisfaction.

The findings highlight that technology startups should integrate risk management, IT governance, and digital innovation strategies to secure sustainable growth and competitive advantage in an increasingly dynamic and uncertain environment. By embedding these practices, startups can strengthen resilience, drive continuous innovation, and build trust among stakeholders. Future research is encouraged to explore additional mediating variables, such as organizational culture or technological capability, to provide deeper insights into the mechanisms that drive startup performance and to further enrich the understanding of how governance and innovation interact in shaping entrepreneurial success.

REFERENCES

[1] I. I. Рекуненко and A. B. Шупік, "RISK MANAGEMENT STRATEGIES FOR MAINTAINING COMPETITIVENESS IN IT FIRMS," *Наукові праці Міжрегіональної Академії управління персоналом. Економічні науки*, no. 3 (75), pp. 84–92, 2024.

[2] L. Hakim, "TANTANGAN DAN STRATEGI INVESTASI PADA PERUSAHAAN STARTUP TEKNOLOGI DI INDONESIA".

[3] I. S. Rozas and M. Er, "Internal and External Challenges in Digital Startup Ecosystem: A Systematic Literature Review," in *2024 2nd International Symposium on Information Technology and Digital Innovation (ISITDI)*, IEEE, 2024, pp. 142–148.

[4] O. S. Joel, A. T. Oyewole, O. G. Odunaiya, and O. T. Soyombo, "Navigating the digital transformation journey: strategies

for startup growth and innovation in the digital era," *Int. J. Manag. Entrep. Res.*, vol. 6, no. 3, pp. 697–706, 2024.
[5] D. K. Rahajeng, "Innovative Governance in the Startup Era: The Interplay of Technology, Innovation, and Value Creation," *J. Indones. Econ. Bus.*, vol. 40, no. 2, pp. 179–195, 2025.
[6] N. Sudirman, "Digital Entrepreneurship and Business Innovation: Strategies for Indonesian SMEs in the Era of Industry 4.0," *J. Indones. Sch. Soc. Res.*, vol. 5, no. 1, pp. 24–34, 2025.
[7] F. Riza and N. A. Luhur, "Navigating the Innovation Landscape: The Crucial Role of Technology and Entrepreneurial Orientation," 2023.
[8] R. Ningsih and W. Murti, "Innovation of Business Models in the Digital Economy: A Case Study of Start-up Companies.," *J. Compr. Sci.*, vol. 3, no. 12, 2024.
[9] A. Ponnam, "Information systems risk management: An audit and control approach," in *Handbook of research on information security and assurance*, IGI Global Scientific Publishing, 2009, pp. 68–84.
[10] S. Fenz, J. Heurix, T. Neubauer, and F. Pechstein, "Current challenges in information security risk management," *Inf. Manag. Comput. Secur.*, vol. 22, no. 5, pp. 410–430, 2014.
[11] J. Kouns and D. Minoli, "Information technology risk management in enterprise environments: A review of industry practices and a practical guide to risk management teams," 2011.
[12] S. Radack, "Conducting Information Security-Related Risk Assessments: Updated Guidelines for Comprehensive Risk Management Programs," National Institute of Standards and Technology, 2012.
[13] M. N. Suresh, T. Varalakshmi, and M. S. Chand, "IT governance framework ensuring effective management and compliance," *Int. Res. J. Adv. Eng. Manag.*, vol. 2, no. 05, pp. 1627–1632, 2024.
[14] T.-P. Liang, Y.-C. Chiu, S. P. J. Wu, and D. Straub, "The impact of IT governance on organizational performance," 2011.
[15] M. Spremić, "IT governance mechanisms in managing IT business value," *WSEAS Trans. Inf. Sci. Appl.*, vol. 6, no. 6, pp. 906–915, 2009.
[16] W. Van Grembergen, S. De Haes, and E. Guldentops, "Structures, processes and relational mechanisms for IT governance," in *Strategies for information technology governance*, IGI Global Scientific Publishing, 2004, pp. 1–36.
[17] V. Raodeo, "IT strategy and governance: Frameworks and best practice," *Int. J. Res. Econ. Soc. Sci.*, vol. 2, no. 3, pp. 49–59, 2012.
[18] A. T. Karabulut, "Digital innovation: An antecedent for digital transformation," *Int. J. Commer. Financ.*, vol. 6, no. 2, pp. 179–186, 2020.
[19] F. Wiesböck and T. Hess, "Digital innovations: Embedding in organizations," *Electron. Mark.*, vol. 30, no. 1, pp. 75–86, 2020.
[20] S. Nambisan, K. Lyytinen, A. Majchrzak, and M. Song, "Digital innovation management," *MIS Q.*, vol. 41, no. 1, pp. 223–238, 2017.
[21] K. Deng, "Three Empirical Studies on Digital Innovation Management: New Organizing Logic of Antecedents and Consequences of Innovation," 2018.
[22] F. Kartika, "The role of innovation in startup success: A comprehensive review," *Adv. J. Ekon. Bisnis*, vol. 2, no. 1, pp. 46–58, 2024.
[23] Y. Konga and K. Ramaiah, "The role of innovation in startup business financing, performance, and survival," in *Handbook of Research on Future Opportunities for Technology Management Education*, IGI Global, 2021, pp. 331–348.
[24] R. Schulte, "New venture risk management: Theoretical framework and research perspectives," *J. Int. Counc. Small Bus.*, pp. 1–20, 2025.
[25] B. Ruiter, "The quantification of start-up performance: An empirical study about the determinants of early stage IT start-up success," 2015, *University of Twente*.
[26] T. R. Eisenmann, "Determinants of early-stage startup performance: Survey results," *Harvard Bus. Sch. Entrep. Manag. Work. Pap.*, no. 21–057, 2020.
[27] E. Aprilia, C. Sani, and M. Rezha, "Manajemen Risiko Perbankan Syariah: PERAN TEKNOLOGI DALAM MANAJEMEN RISIKO DAN INOVASI," *An Najah (Jurnal Pendidik. Islam dan Sos. Keagamaan)*, vol. 4, no. 1, pp. 39–50, 2025.
[28] G. Matturro, P. Franco, and S. Ledesma, "Technical and Business Risk Management in Software Startups," in *International Conference on Information Technology & Systems*, Springer, 2024, pp. 75–85.
[29] G. Duchidze, "RISK MANAGEMENT AS A DETERMINING FACTOR IN THE EFFECTIVENESS OF INNOVATION MANAGEMENT," თავდაცვა და მეცნიერება, vol. 3, pp. 103–112, 2024.
[30] O. F. Nahid, R. Rahmatullah, M. Al-Arafat, M. Enamul Kabir, and A. Dasgupta, "Risk mitigation strategies in large scale infrastructure project: A project management perspective," 2024.
[31] K. Anggraito, M. Lubis, H. Fakhrurroja, and A. R. Lubis, "Relationship of IT Governance Domain with a Case Study of the Application of 'One Price Fuel in Indonesia' by National Oil Company," in *International conference on WorldS4*, Springer, 2023, pp. 35–45.
[32] F. S. Lubis, V. S. Praditha, M. Lubis, H. Fakhrurroja, M. F. Safitra, and A. R. Lubis, "Corporate ICT Governance of Indonesian State-Owned Companies: Governance Structure and Decision Making Archetype," in *2023 IEEE International Conference on Computing (ICOCO)*, IEEE, 2023, pp. 277–282.
[33] C. H. Primasari and D. B. Setyohadi, "Supporting factors of IT business alignment at Indonesian it companies," *Int. J. Heal. Sci. Technol.*, vol. 3, no. 3, 2022.
[34] A. Hamzah, "Penyelarasan Strategi Bisnis dan Strategi Sistem/Teknologi Informasi Untuk Peningkatan Kinerja

Organisasi," *InFestasi*, vol. 3, no. 2, pp. 79–89, 2007.
[35] Y. Zhou, C. Yang, Z. Liu, and L. Gong, "Digital technology adoption and innovation performance: a moderated mediation model," *Technol. Anal. Strateg. Manag.*, vol. 36, no. 11, pp. 3341–3356, 2024.
[36] D. Arkhipova, G. Vaia, W. DeLone, and C. Braghin, "IT governance in the digital era," *Univ. Ca'Foscari Venezia Work. Pap. SSRN*, vol. 12, 2016.
[37] A. Alhuraibi, "From IT-business strategic alignment to performance: A moderated mediation model of social innovation, and enterprise governance of IT," 2017.
[38] N. K. N. Kuteesa, N. C. U. Akpuokwe, and N. C. A. Udeh, "Navigating the digital transformation journey: Strategies for startup growth and innovation in the digital era," *Int. J. Sch. Res. Multidiscip. Stud.*, vol. 4, no. 2, pp. 38–53, 2024.