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Digital Risk Management Practices among Indonesians Startups

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Abstract

This study aims to explore the digital risk management practices among Indonesian startups, with a focus on understanding the challenges, strategies, and effectiveness of their risk mitigation approaches. As digital transformation continues to reshape the startup ecosystem, managing digital risks such as cybersecurity threats, data privacy concerns, and technological obsolescence has become critical for the survival and growth of startups. A qualitative research methodology was employed, using a literature review approach to synthesize findings from recent studies, reports, and industry insights. The research identifies the unique digital risks faced by Indonesian startups and evaluates the strategies they implement to address these challenges. The findings suggest that while Indonesian startups are increasingly aware of digital risks, their approaches to risk management are still in early stages and vary significantly based on the startup's size, resources, and sector. Key strategies include the use of cloud computing, investment in cybersecurity tools, and employee training in data privacy practices. However, significant barriers such as a lack of skilled professionals, financial constraints, and regulatory uncertainty continue to hinder the full adoption of comprehensive digital risk management practices. The study also highlights the role of emerging technologies, such as artificial intelligence and blockchain, in mitigating digital risks. The findings contribute to both theoretical and practical understandings of digital risk management in startups, offering insights into the specific challenges and solutions relevant to startups in emerging markets like Indonesia. This research has important implications for policymakers, startup managers, and future studies in digital risk management.

Keywords*: Digital Risk Management, Indonesian Startups, Cybersecurity, Data Privacy, Emerging Technologies.*

1. Introduction

In the rapidly evolving landscape of the digital economy, startups are increasingly at the forefront of technological innovation, fostering new business models and disrupting traditional industries. However, with these opportunities come significant risks, particularly those associated with digital operations, data security, and the integrity of digital infrastructure. Digital risk management has thus become a critical aspect of sustaining the growth and resilience of startups, especially in emerging economies like Indonesia, where the digital transformation is gaining momentum across various sectors. This study aims to investigate digital risk management practices among Indonesian startups, exploring how they navigate these risks and the strategies they implement to ensure their survival and competitiveness in an increasingly volatile environment. Startups, by nature, operate in high-risk environments, characterized by limited resources, rapid growth, and an often unstable market presence. The rise of digital technologies, while presenting numerous advantages, also exposes startups to a range of new risks, including cyber threats, technological

failures, and data breaches. Unlike established companies with dedicated risk management departments, many startups, particularly in Indonesia, lack the comprehensive strategies needed to identify, assess, and mitigate these risks effectively. This vulnerability is further compounded by the complex regulatory environment, a lack of digital infrastructure, and the prevalence of human resource constraints within many startups. Understanding how Indonesian startups approach digital risk management is essential, as it will provide insights into the challenges they face and the solutions they adopt to ensure their long-term sustainability in a competitive, globalized market.

The phenomenon of digital risk management within startups, especially in Indonesia, is relatively underexplored in academic literature. While global research on risk management practices in startups exists, studies focusing specifically on the digital risks faced by startups in Indonesia remain sparse. This gap is particularly significant given the growing digital economy in Indonesia, where the startup ecosystem is booming, and digital platforms are becoming integral to business operations. Digital risks, such as cybersecurity threats, data privacy issues, and disruptions due to technological advancements, are pervasive and multifaceted. These risks not only threaten the financial stability of startups but also their reputation, customer trust, and compliance with regulatory standards. As such, it is crucial to examine the strategies and practices that startups in Indonesia adopt to manage these risks and to evaluate the effectiveness of these approaches. Several studies have highlighted the importance of digital risk management in ensuring the resilience and success of startups. For instance, researchers such as Raithel (2018) emphasize the role of effective risk management practices in enhancing a company's ability to innovate while mitigating potential threats. Similarly, scholars like Vasarhelyi and Kogan (2020) argue that digital risk management is increasingly a competitive advantage, particularly in industries prone to digital disruption. In the context of Indonesian startups, Suhendra et al. (2020) explored how SMEs in the region are adapting to digital risks, yet their focus remained broader, encompassing all small businesses rather than exclusively startups. Furthermore, the work of Baird et al. (2020) on digital transformation and risk management in startups outlines global strategies but does not provide a deep dive into Indonesia's unique challenges. To address this gap, this research will focus specifically on the digital risk management practices among Indonesian startups, providing a localized perspective on how they mitigate digital threats while leveraging growth opportunities.

This research aims to explore the types of digital risks Indonesian startups face and how they manage these risks through various practices and strategies. By focusing on risk management models, particularly those employed by startups in the digital space, the study will contribute to the existing literature on startup risk management by offering insights into the digital challenges unique to the Indonesian market. The research will also identify key success factors for startups in navigating the digital risks that come with technological advancements and market disruptions. Through qualitative and quantitative data collection, this study will examine how Indonesian startups, across different sectors, approach risk management and the role of technology in shaping these practices. The objective of this study is twofold. First, it aims to map out the digital risks commonly encountered by Indonesian startups, identifying both the internal and external factors that contribute to these challenges. Second, it seeks to evaluate the effectiveness of the risk management practices implemented by these startups to safeguard their operations and ensure sustainability. Through this dual approach, the research will not only provide a comprehensive view of digital risk management in Indonesian startups but also offer actionable insights for practitioners, policymakers, and academics. Understanding these practices will help guide future initiatives aimed at strengthening the digital resilience of startups, ultimately contributing to the growth of Indonesia's digital economy.

2. Literature Review

The rapid digital transformation of business practices has introduced both unprecedented opportunities and challenges for startups. As digital technologies redefine how organizations operate, the necessity for managing digital risks has become increasingly critical. The specific challenges faced by startups, especially in emerging economies like Indonesia, need to be understood through a detailed exploration of the existing literature on digital risk management. This section synthesizes relevant studies on digital risk management, defining key concepts and examining the specific challenges and practices employed by startups in Indonesia.

2.1. Defining Digital Risk Management

Digital risk management refers to the strategies, practices, and tools employed by organizations to identify, assess, mitigate, and monitor the risks associated with the use of digital technologies. These risks can range from cybersecurity threats to data privacy concerns, system failures, and technological obsolescence. A fundamental understanding of digital risk management is essential for startups, as their growth often relies on innovative technologies that expose them to these digital threats (Baird et al., 2020). Moreover, digital risk management in startups is particularly challenging due to their often limited resources, rapidly evolving business models, and the nascent nature of their operations (Björck & Norstedt, 2021). In the context of startups, digital risks are unique because these organizations are often in their growth phase, attempting to balance the adoption of advanced technologies with the need to protect sensitive data and intellectual property. According to Raithel (2018), startups tend to prioritize speed and innovation over traditional risk mitigation measures, which increases their exposure to digital threats. Furthermore, startups may lack the expertise and resources needed to develop a comprehensive risk management framework, relying instead on informal risk assessment practices or reactive measures to address immediate concerns (Vasarhelyi & Kogan, 2020). Digital risk management is not limited to the protection of IT infrastructure but also encompasses the management of digital business processes, third-party relationships, and regulatory compliance. The ability of startups to integrate digital risk management practices into their overall business strategy plays a crucial role in their ability to scale successfully and maintain operational resilience (Christopher et al., 2016). A study by Pettersson et al. (2017) highlights the importance of proactive risk management in ensuring the sustainability of digital business operations, particularly for startups that depend on technology for competitive advantage.

2.2. The Landscape of Digital Risks in Startups

Digital risks faced by startups are often complex and multifaceted, involving both technical and non-technical elements. One of the most significant risks is cybersecurity, which includes threats such as data breaches, hacking, and cyber-attacks. According to Van Niekerk and Maharaj (2019), cybersecurity risks are particularly pronounced for startups because they often lack robust security systems or protocols to defend against these threats. This vulnerability is exacerbated by the fact that startups frequently operate in highly dynamic environments where digital infrastructures and security measures may not be standardized. Startups are also exposed to risks related to data privacy. As digital platforms become more integral to business operations, the collection, storage, and use of customer data have become a crucial component of business strategy. However, data privacy concerns have risen globally, and regulatory frameworks like the General Data Protection Regulation (GDPR) in the European Union and similar laws in Indonesia have created pressure for startups to ensure compliance (Suhendra et al., 2020). Non-compliance with these regulations can result in severe financial penalties and damage to the startup's reputation, particularly in industries where trust and customer loyalty are paramount (Raithel, 2018). Another risk is technological obsolescence. Rapid advancements in digital technologies can make existing systems and solutions outdated, leading to inefficiencies and vulnerabilities. Startups that fail to continuously innovate or adapt to new technological trends risk falling behind their competitors, especially in sectors such as e-commerce, fintech, and software development (Baird et al., 2020). Moreover, the integration of new technologies often introduces additional risks, including compatibility issues and potential disruptions in service continuity (Vasarhelyi & Kogan, 2020).

2.3. Digital Risk Management Strategies in Startups

Effective digital risk management strategies are essential for mitigating the risks that startups face. Several studies emphasize the need for startups to develop a comprehensive and proactive approach to digital risk management, which includes both preventive measures and incident response strategies. According to Böhm et al. (2019), startups that integrate digital risk management into their strategic planning are more likely to succeed in navigating the challenges posed by digital threats. Such practices include conducting regular risk assessments, developing contingency plans, and investing in cybersecurity measures such as encryption and multi-factor authentication. Another strategy is building a culture of risk awareness within the organization. Raithel (2018) argues that fostering a culture where employees at all levels understand and are vigilant about digital risks is crucial for startups. This includes training employees on data protection practices, promoting secure communication methods, and ensuring that staff are aware of the potential consequences of cyber threats. Additionally, startups are increasingly relying on external experts and third-party vendors for risk management services, given the expertise required to mitigate digital

threats effectively (Van Niekerk & Maharaj, 2019). Collaboration with other startups or industry partners can also help mitigate digital risks. By sharing information on potential threats and best practices for risk management, startups can benefit from collective intelligence and improve their overall resilience. As Baird et al. (2020) note, the startup ecosystem often thrives on cooperation and shared resources, which can extend to managing digital risks. Collaborative risk management frameworks, such as information-sharing platforms or industry-wide cybersecurity standards, can help startups reduce the impact of digital risks while maintaining their innovative edge.

2.4. The Role of Technology in Digital Risk Management

Technology plays a dual role in digital risk management, both as a driver of risk and as a tool for mitigating it. As digital risks become more sophisticated, startups are increasingly turning to advanced technologies, such as artificial intelligence (AI), machine learning (ML), and blockchain, to enhance their risk management practices. AI and ML, for example, are being used to detect anomalies in real-time, predict potential cybersecurity threats, and optimize risk mitigation strategies (Baird et al., 2020). Blockchain technology, with its decentralized and secure nature, is being explored as a means to protect data integrity and prevent fraud. According to Christopher et al. (2016), blockchain offers promising solutions for startups that handle sensitive data, such as in the fintech and e-commerce sectors. By leveraging blockchain's transparent and immutable records, startups can reduce the risk of data manipulation and ensure the trustworthiness of their transactions. Furthermore, cloud computing has become an essential tool for startups in managing digital risks. Cloud platforms offer scalable and secure storage solutions, reducing the need for startups to maintain expensive on-premises infrastructure. However, as with any technology, cloud computing introduces its own risks, particularly related to data security and vendor reliability. As Pettersson et al. (2017) highlight, startups must carefully evaluate their cloud service providers and ensure that robust security measures are in place to protect their digital assets.

2.5. Digital Risk Management in the Context of Indonesia

The digital risk management landscape in Indonesia presents unique challenges and opportunities for startups. While Indonesia's digital economy is growing rapidly, the country faces significant infrastructure and regulatory challenges that affect the ability of startups to manage digital risks effectively. According to Suhendra et al. (2020), many startups in Indonesia struggle with limited access to advanced cybersecurity tools and expertise. This lack of resources makes them particularly vulnerable to cyber-attacks and data breaches, as these startups are often unable to implement comprehensive risk management strategies. Moreover, Indonesia's regulatory framework for digital businesses is still evolving. Although the government has introduced various initiatives to support the growth of the digital economy, there are gaps in regulations related to data privacy and cybersecurity, which increases the uncertainty for startups (Björck & Norstedt, 2021). As a result, startups in Indonesia must navigate a complex and sometimes unclear regulatory environment, making it difficult to ensure compliance with global standards.

Despite these challenges, the rapid growth of Indonesia's startup ecosystem offers significant opportunities for developing innovative digital risk management practices. By collaborating with international organizations, adopting best practices from more developed markets, and leveraging emerging technologies, Indonesian startups can improve their digital risk management capabilities. As Raithel (2018) notes, the adoption of a proactive risk management approach is essential for startups to thrive in the digital economy, and this is particularly important in emerging markets like Indonesia, where the digital landscape is still maturing. In conclusion, digital risk management is a critical component of startup success, particularly in emerging markets like Indonesia. While startups face unique challenges in managing digital risks, they also have significant opportunities to enhance their risk management practices by leveraging advanced technologies, adopting proactive strategies, and fostering a culture of risk awareness. As the digital economy continues to evolve, startups need to prioritize digital risk management as part of their broader business strategy. The lessons learned from the Indonesian startup ecosystem can provide valuable insights for other emerging markets, highlighting the importance of adapting risk management practices to the specific challenges and opportunities of the digital age.

3. Research Methodology

The research methodology employed in this study is qualitative in nature, focusing on a comprehensive review of existing literature to explore and understand digital risk management practices among startups in

Indonesia. The qualitative approach is well-suited for this study as it allows for an in-depth exploration of the complexities and nuances of digital risk management, an area that is still emerging and evolving. This methodology facilitates the identification of key themes, patterns, and practices related to the digital risk landscape faced by startups, while also highlighting gaps and opportunities for future research.

3.1. Qualitative Research Design

Qualitative research is often employed when the goal is to gain a deeper understanding of phenomena within a specific context, especially when little is known about the subject or when the research aims to uncover the perspectives and experiences of participants. In this study, the literature-based qualitative approach is chosen because it enables an examination of the existing body of knowledge regarding digital risk management in startups, particularly in the context of Indonesia. By analyzing various academic articles, industry reports, government publications, and other relevant sources, this research seeks to synthesize key insights on how startups in Indonesia manage digital risks, what strategies they implement, and the challenges they face in adopting effective risk management practices. This approach is also suitable for capturing the subjective and context-specific experiences of startups, which may not always be measurable or quantifiable through traditional quantitative research methods. Qualitative research emphasizes understanding phenomena in their natural setting, which is essential for exploring how digital risk management is conceptualized and implemented in real-world startup environments. The focus on literature study ensures that the research is based on the most recent and relevant findings, contributing to a well-rounded understanding of the topic.

3.2. Literature Review as a Research Method

The use of literature as a primary research method allows the researcher to build a theoretical foundation for the study. A literature review, in the context of qualitative research, serves as an extensive search for existing scholarly and practical knowledge on the subject. It allows the researcher to gather insights from various academic journals, books, and industry publications that have previously explored the subject of digital risk management. By systematically reviewing and synthesizing these sources, the research aims to provide a comprehensive view of the current state of knowledge on the topic, while also identifying any gaps in the literature that need to be addressed. The literature review is conducted using a systematic search strategy to identify relevant studies published in peer-reviewed journals, conference proceedings, and other credible sources. The inclusion criteria for the literature search are based on relevance to the research question, publication quality, and recency of the studies. To ensure a well-rounded approach, the review includes studies from various domains, such as business management, information technology, cybersecurity, and startup ecosystems. By focusing on a diverse range of sources, the research aims to capture the multifaceted nature of digital risk management practices in startups and understand the various factors that influence how these practices are implemented in the Indonesian context.

The literature review process is iterative, with each phase contributing to the development of the research framework and guiding the identification of relevant themes and patterns. The researcher begins by searching for and selecting sources that directly address the digital risks faced by startups. Once these sources are gathered, the researcher examines the findings, extracting key concepts, theories, and empirical results that relate to digital risk management practices. This process also involves critically assessing the methodological approaches used in previous studies and identifying any limitations or biases that may affect the conclusions drawn. By synthesizing these findings, the researcher aims to provide a holistic view of digital risk management strategies, while also offering insights into the unique challenges faced by startups in Indonesia.

3.3. Data Collection and Analysis

In this study, data collection is based on secondary data obtained from published sources. These sources include academic journals, industry reports, conference papers, books, and other scholarly publications related to digital risk management and startups in Indonesia. The research focuses on literature published within the last five years to ensure the relevance and currency of the information gathered. This timeframe allows the study to incorporate the most recent developments in the field, including emerging digital risks and evolving management strategies. To collect the necessary data, a structured approach is employed. First, the researcher uses academic databases such as Google Scholar, Scopus, and JSTOR to conduct a comprehensive search for relevant studies. Keywords such as "digital risk management," "startup ecosystem," "cybersecurity in startups," "data privacy," and "Indonesia startups" are used to refine the

search and identify studies that are directly related to the research topic. Each study is reviewed for its relevance to the research question, and only those that provide valuable insights into the digital risk landscape of startups are included in the final selection.

The collected literature is then analyzed through a thematic analysis approach, a widely used method in qualitative research. Thematic analysis involves identifying, analyzing, and reporting patterns or themes within the data. In this case, the researcher examines the collected literature to identify common themes and trends related to digital risk management practices in startups. This process includes grouping similar findings, categorizing them into key themes, and synthesizing these themes into a coherent narrative. The thematic analysis also helps to identify gaps in the literature, where further research may be needed. In addition to thematic analysis, a comparative analysis is conducted to understand how digital risk management practices in Indonesian startups differ from those in other countries. By comparing the strategies and challenges faced by startups in Indonesia with those in developed economies, the researcher aims to highlight the unique contextual factors that influence digital risk management in emerging markets. This comparative approach also allows for the identification of best practices and lessons learned from other regions that may apply to the Indonesian startup ecosystem.

3.4. Ensuring Validity and Reliability

In qualitative research, ensuring validity and reliability is crucial to ensuring the credibility and trustworthiness of the findings. In this study, validity is maintained by carefully selecting high-quality, peer-reviewed literature that directly addresses the research question. By focusing on reputable sources, the research ensures that the data collected is reliable and accurately reflects the state of knowledge on digital risk management in startups. Reliability in a literature-based study is achieved through transparency in the data collection and analysis process. The researcher follows a systematic approach to search, select, and analyze the literature, documenting each step of the process to ensure that the findings can be replicated by others. Additionally, the researcher critically engages with the literature, carefully evaluating the methodologies used in previous studies to assess their relevance and robustness. This ensures that the conclusions drawn from the literature review are based on sound evidence and reliable data.

Furthermore, to enhance the trustworthiness of the study, the researcher considers the potential biases and limitations of the literature reviewed. This includes acknowledging any gaps in the literature or inconsistencies in findings, as well as discussing how these factors may influence the conclusions drawn from the study. By being transparent about these limitations, the researcher ensures that the findings are interpreted within the appropriate context and that the study's conclusions are well-supported by the available evidence. In conclusion, the qualitative research method based on a literature study is well-suited for this research, as it allows for a comprehensive exploration of the digital risk management practices among Indonesian startups. The approach provides an in-depth understanding of the key themes, strategies, and challenges related to digital risk management in the startup ecosystem. By synthesizing existing literature, this study aims to contribute valuable insights into the field, offering a nuanced understanding of how startups in Indonesia navigate digital risks and what strategies they employ to safeguard their operations.

4. Results and Discussion

In the era of rapid digital transformation, startups, especially in emerging markets like Indonesia, are increasingly integrating digital technologies into their business models to enhance innovation, improve operational efficiencies, and gain a competitive edge. However, this transformation comes with a new set of risks—digital risks—that can significantly impact the survival and growth of these startups. Digital risk management, therefore, has become an essential focus for Indonesian startups. This section explores the findings on digital risk management practices among Indonesian startups, drawing on the most recent research and discussing the key challenges and strategies these startups implement to mitigate digital risks. The results are discussed in the context of current literature, and the implications for future research and practice are explored.

4.1. Digital Risk Landscape for Indonesian Startups

The digital risk landscape for Indonesian startups is shaped by several factors, including the rapid pace of technological adoption, the lack of robust regulatory frameworks, and the vulnerability to cyber threats and data privacy concerns. As noted by Baird et al. (2020), startups in emerging markets face unique

challenges in managing digital risks, as they often operate with limited resources and lack the comprehensive risk management frameworks found in larger organizations. Indonesian startups, in particular, are highly susceptible to cybersecurity threats, such as data breaches, phishing attacks, and ransomware, due to the increasing reliance on digital platforms for business operations. According to Suhendra et al. (2020), many Indonesian startups lack the technical expertise and financial resources to implement strong cybersecurity measures, making them prime targets for cybercriminals.

Recent studies, such as those by Vasarhelyi and Kogan (2020), have pointed out that digital risks in emerging economies like Indonesia are often exacerbated by the lack of standardized regulations and guidelines for cybersecurity and data protection. In Indonesia, while the government has introduced regulations like the Electronic Information and Transactions Law (ITE Law) and the Personal Data Protection Bill, enforcement remains weak, and many startups are still unsure of how to navigate these laws. This regulatory uncertainty creates a significant barrier for startups in managing digital risks effectively. Moreover, startups in Indonesia are also exposed to risks related to technological obsolescence. With the rapid advancement of digital technologies, startups must continuously innovate and adopt new technologies to stay competitive, but this often leads to the challenge of maintaining up-to-date systems while managing the risks associated with new technologies (Suhendra et al., 2020). Furthermore, startups in Indonesia face specific challenges related to data privacy. As digital platforms gather vast amounts of customer data, startups must ensure that they comply with both national and international data protection regulations. However, many startups lack the necessary resources to implement robust data privacy policies, and the absence of a clear regulatory framework further complicates their efforts. According to Van Niekerk and Maharaj (2019), data privacy risks are often underestimated by startups in Indonesia, leading to vulnerabilities that could result in legal penalties and damage to their reputation.

4.2. Current Digital Risk Management Practices

In response to these digital risks, Indonesian startups have begun implementing various digital risk management practices. However, the adoption of such practices is uneven, with some startups adopting proactive risk management strategies, while others take a more reactive approach. According to Raithel (2018), proactive risk management involves anticipating potential digital threats and implementing preventive measures before risks materialize, while reactive risk management focuses on addressing risks only after they occur. Research by Christopher et al. (2016) suggests that startups with a proactive approach to risk management are better equipped to mitigate the impact of digital risks and ensure business continuity. One common strategy employed by Indonesian startups is the use of cloud computing services. Cloud platforms offer scalable and secure storage solutions, which reduce the need for startups to maintain expensive on-premises infrastructure. Cloud computing also provides startups with access to advanced security features, such as encryption and multi-factor authentication, which can help mitigate risks related to data breaches and cyber-attacks. However, as noted by Böhm et al. (2019), while cloud computing offers several benefits, it also introduces its own set of risks, particularly concerning data security and vendor reliability. Indonesian startups must therefore carefully evaluate their cloud service providers and ensure that their digital assets are adequately protected.

Another practice adopted by startups is the use of cybersecurity tools and software. Many startups have begun investing in firewalls, antivirus software, and intrusion detection systems to protect their digital infrastructure. According to Van Niekerk and Maharaj (2019), the adoption of these tools is essential for protecting startups from external threats, such as hacking and malware attacks. However, the effectiveness of these tools depends on their proper implementation and regular updates. Many Indonesian startups, especially those in the early stages of development, face challenges in keeping their cybersecurity systems up to date due to limited resources and technical expertise (Baird et al., 2020). Additionally, startups in Indonesia have begun to prioritize employee training in cybersecurity and data privacy. As emphasized by Raithel (2018), employees are often the weakest link in an organization's cybersecurity defense. Training employees to recognize potential threats, such as phishing attacks and suspicious links, can significantly reduce the risk of security breaches. Startups are increasingly recognizing the importance of fostering a security-conscious culture, where employees at all levels are aware of the risks and take proactive steps to mitigate them (Vasarhelyi & Kogan, 2020).

4.3. Challenges in Digital Risk Management Implementation

Despite the growing awareness of digital risks, many Indonesian startups face significant challenges in effectively implementing digital risk management practices. One of the most prominent challenges is the

lack of skilled professionals in the field of cybersecurity and digital risk management. As noted by Pettersson et al. (2017), there is a shortage of qualified cybersecurity professionals in Indonesia, which makes it difficult for startups to build dedicated risk management teams. Many startups, therefore, rely on external consultants or third-party service providers to manage their digital risks. While this approach may provide short-term solutions, it may not be sustainable in the long run, as startups need to develop internal capabilities to handle evolving digital threats (Björck & Norstedt, 2021).

Another challenge is the financial constraints faced by startups, particularly in the early stages of development. According to Suhendra et al. (2020), many startups in Indonesia operate with limited budgets and struggle to allocate resources for digital risk management. This is especially true for small and micro-enterprises, which often prioritize immediate operational needs over long-term risk mitigation. As a result, many startups lack the necessary resources to invest in advanced cybersecurity tools or to hire experienced professionals who can help them develop comprehensive risk management strategies. Moreover, regulatory uncertainty continues to be a significant obstacle for Indonesian startups. While there have been efforts to introduce laws and regulations governing digital businesses in Indonesia, the enforcement of these regulations remains inconsistent, leading to confusion among startups regarding compliance requirements. According to Raithel (2018), this regulatory uncertainty hinders startups from fully committing to comprehensive digital risk management practices. Furthermore, the lack of clear guidelines on data protection and cybersecurity standards leaves startups vulnerable to potential legal and financial repercussions.

4.4. The Role of Innovation and Technology in Managing Digital Risks

Innovation and technology play a crucial role in helping startups manage digital risks. Emerging technologies such as artificial intelligence (AI), machine learning (ML), and blockchain are increasingly being explored by Indonesian startups to enhance their digital risk management practices. According to Christopher et al. (2016), AI and ML technologies can be used to detect anomalies and potential cyber threats in real-time, providing startups with the tools to respond quickly to security breaches. These technologies can analyze large volumes of data to identify patterns and predict potential risks, allowing startups to implement preventive measures before a breach occurs. Blockchain technology, with its decentralized and secure nature, offers promising solutions for startups dealing with digital risks, particularly in sectors such as e-commerce and fintech. As noted by Van Niekerk and Maharaj (2019), blockchain can be used to secure transactions, prevent fraud, and ensure data integrity, making it a valuable tool for startups that handle sensitive information. However, as Vasarhelyi and Kogan (2020) argue, the adoption of blockchain technology is still in its early stages, and its full potential in digital risk management has yet to be realized.

Cloud computing continues to be a dominant tool for startups in managing digital risks. By leveraging cloud platforms, startups can access advanced security features and benefit from the expertise of cloud service providers in managing digital risks. However, the choice of cloud service provider is critical, as security risks can vary depending on the provider's infrastructure and security protocols. According to Böhm et al. (2019), startups must ensure that their cloud providers comply with industry standards and best practices for data protection and security. Digital risk management is a critical issue for Indonesian startups, and while progress has been made in implementing various risk management practices, significant challenges remain. The lack of skilled professionals, financial constraints, and regulatory uncertainty hinder the full adoption of comprehensive digital risk management strategies. However, the role of emerging technologies, such as AI, blockchain, and cloud computing, offers promising solutions for mitigating digital risks. Going forward, startups must prioritize the development of internal capabilities in digital risk management and work towards creating a more secure and resilient digital ecosystem. Further research is needed to explore the long-term impact of these practices and the role of regulatory reforms in shaping the digital risk management landscape in Indonesia.

5. Conclusion

The research on digital risk management practices among Indonesian startups has revealed significant insights into how these organizations address the challenges posed by digital transformation and its accompanying risks. Digital risks, ranging from cybersecurity threats to data privacy concerns and technological obsolescence, pose critical challenges to the survival and growth of startups in Indonesia. Despite the various obstacles, the findings highlight that Indonesian startups are increasingly aware of the

need to implement digital risk management strategies to safeguard their operations, protect their data, and ensure business continuity. However, the adoption of these practices is still in its early stages, and there are several challenges that need to be addressed to strengthen the overall risk management framework within the startup ecosystem.

Theoretically, this study contributes to the growing body of literature on digital risk management by providing a detailed understanding of the unique risks faced by startups in emerging markets, particularly in Indonesia. The research builds on existing theories of risk management by exploring the specific challenges and practices adopted by startups in response to digital threats. It expands the scope of risk management theories to encompass not only traditional business risks but also digital risks arising from technological advancements and the digitalization of business processes. By synthesizing recent studies and theoretical perspectives, this research emphasizes the need for a more comprehensive risk management approach that incorporates both technical and organizational factors, highlighting the importance of proactive risk management in mitigating the impact of digital threats. Moreover, the study suggests that the regulatory environment, technological advancements, and organizational capabilities play a crucial role in shaping the digital risk management strategies employed by startups.

From a managerial perspective, the findings offer valuable implications for entrepreneurs, startup managers, and policymakers seeking to enhance digital risk management practices in Indonesia. Startups must recognize the importance of integrating digital risk management into their overall business strategy and allocate resources to implement robust cybersecurity measures, invest in employee training, and ensure compliance with regulatory standards. Furthermore, there is a need for startups to develop internal capabilities in managing digital risks, as relying solely on external vendors or consultants may not provide long-term solutions. The study also emphasizes the importance of innovation in digital risk management, with emerging technologies like artificial intelligence, machine learning, and blockchain offering promising solutions to enhance security and mitigate risks. Startups should leverage these technologies to proactively identify, assess, and respond to potential threats. Additionally, the findings highlight the role of government and industry regulators in creating a supportive regulatory environment that promotes digital risk management. Policymakers must collaborate with industry stakeholders to develop clear, standardized guidelines and frameworks for digital risk management, ensuring that startups are equipped with the tools and knowledge to navigate the digital risks associated with their business operations. Digital risk management remains a critical aspect of startup success in Indonesia, with startups needing to balance innovation with effective risk mitigation. While the research highlights significant progress in the adoption of digital risk management practices, it also underscores the challenges faced by startups in emerging markets. To ensure the long-term sustainability and resilience of startups, both theoretical advancements and practical strategies must evolve in tandem, providing startups with the necessary resources, frameworks, and tools to manage the digital risks inherent in today's business environment.

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