

Technology-Based Financial Risk Management Strategy: Overview of Recent Developments

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Abstract

Technological developments have had a significant impact on financial risk management. In this context, the application of artificial intelligence, the use of data analytics, and the role of blockchain technology are the main focus for increasing efficiency and accuracy in managing financial risks. This study aims to analyze technology-based financial risk management strategies with a focus on the application of artificial intelligence, the use of data analytics, and the role of blockchain technology. This research was conducted using a qualitative approach with a literature study as a research method. The data used comes from the results of previous research and studies that are related to technology-based financial risk management. This study found that technology-based financial risk management provides advantages in the form of operational efficiency, cost savings, and increased accuracy in risk analysis. However, challenges such as data security and privacy and the complexity of technology system integration must be overcome. In developing an effective technology-based risk management strategy, companies need to increase organizational understanding and awareness, develop a supportive regulatory framework, and conduct human resource skills training. Collaboration, continuous evaluation, and a sustainable approach are also keys to success in optimizing the use of technology in managing financial risks.

Keywords: Management Strategy, Financial Risk, Technology Development.

A. INTRODUCTION

The development of information and communication technology has significantly changed the landscape of the financial industry. In this digital era, companies and financial institutions need to develop effective strategies for managing financial risk to ensure operational continuity and sustainable growth. However, rapid changes in technology also bring new challenges in managing financial risks. One of the main challenges in managing financial risk is the complexity and diversity of risks faced by companies (Wójcik & Ioannou, 2020). Financial risk can come from various factors, such as market fluctuations, regulatory changes, and economic instability. Therefore, it is necessary to have a comprehensive and adaptive strategy for managing this risk. In recent years, technological developments such as artificial intelligence, data analytics, and blockchain have provided new opportunities in financial risk management. The advantage of these technologies lies in their ability to quickly and accurately analyze data, identify trends, and provide valuable insights for better decision-making (Irwin et al., 2022).

Technology implementation in financial risk management can also help reduce human errors that may occur. Humans are prone to fatigue, inaccuracy, and bias, which can negatively impact risk management. Using technology, the risk management process can be automated, reducing the risk of errors and increasing efficiency. In addition, technological developments have also made it possible to have platforms and systems that are more integrated, enabling information and data related to financial risk to be accessed and processed in real-time (Leesakul et al., 2022). This allows companies to have a better understanding of their risk exposure and take prompt and appropriate action. The use of technology in managing financial risk also provides an opportunity for companies to implement a more proactive risk management strategy. With more accurate and real-time data, companies can identify potential risks earlier, design appropriate mitigation plans, and take the necessary preventive steps before these risks occur (Haluza & Jungwirth, 2023).

However, despite the many potentials and benefits offered by technology in managing financial risks, there are still some challenges that need to be overcome. One of them is data security and privacy. In adopting new technologies, companies need to ensure that their data is properly protected and not misused by unauthorized parties (Choi et al., 2022). In addition, technology implementation also requires significant investment, both in terms of technological infrastructure and skilled human resources. Companies must consider financial aspects, resources, and organizational adaptability before adopting new technology in managing financial risks (Chowdhury et al., 2023).

Therefore, this study aims to review the latest developments in technology-based financial risk management. Through this review, it is expected to provide comprehensive insights into the latest strategies in technology-based financial risk management, the challenges faced, and the benefits that can be obtained.

B. LITERATURE REVIEW

1. Risk Management

According to Hanafi, risk is a hazard, result, or consequence that can occur as a result of an ongoing process or future event. Risk can be interpreted as a state of uncertainty, where if an unwanted condition occurs it can cause a loss (Ramazani et al., 2022).

According to Hanafi, the types of risks that are commonly known include:

- a. Pure risk is the uncertainty of a loss or in other words, there is only a loss opportunity and not a profit opportunity. Pure risk is a risk that if it occurs will result in a loss and if it does not occur it will not cause a loss but also does not generate a profit. There are only two kinds of risks: loss or break event, for example, theft, accident, or fire (Arikan et al., 2020).

- b. Speculative risk is the risk associated with the occurrence of two possibilities, namely the opportunity to experience financial loss or gain. There are three kinds of risks: loss, profit, or break event, for example, investing in stocks on the stock exchange, buying sweepstakes, and so on (Ilkevich et al., 2022).

According to Bramantyo, risk management is a structured and systematic process of identifying, measuring, mapping, developing alternative risk treatments, and monitoring and controlling risk management. The implementation of this risk management helps companies identify risks from the start and helps make decisions to deal with these risks (Kaikkonen et al., 2021). Strategies that can be taken include transferring risks to other parties, avoiding risks, reducing the negative effects of risks, and accommodating some or all of the consequences of certain risks. Traditional risk management focuses on risks arising from physical or legal causes (such as natural disasters or fires, deaths, and lawsuits). Financial risk management, on the other hand, focuses on risks that can be managed using financial instruments (Kuhlicke et al., 2020).

The objective of implementing risk management is to reduce the different risks associated with the selected field to a level that is acceptable to society. This can be in the form of various types of threats caused by the environment, technology, humans, organizations, and politics. On the other hand, the implementation of risk management involves all means available to humans, in particular, to risk management entities (Ruangpan et al., 2020).

According to Bramantyo, risks to companies can be categorized into four types, namely:

- a. Financial Risk.

Financial risk is the fluctuation of the company's financial targets or monetary size due to fluctuations in various macro variables. Financial measures can be in the form of cash flow, company profits, and sales growth. Financial risk consists of liquidity risk, credit risk, and capital risk (Zhu et al., 2021).

- b. Operational Risk.

Operational risk is the potential deviation from the expected results due to a malfunction of a system, human resources, technology, or other factors. Operational risk can occur at two levels, namely technical and organizational. At a technical level, operational risk can occur if the information system, records errors, inadequate information, and inaccurate and inadequate risk measurement (Nimmy et al., 2022). At the organizational level, operational risk can arise because monitoring and reporting systems, systems and procedures, and policies do not work as they should. Operational risk consists of productivity risk, technology risk, innovation risk, system risk, and process risk (Araz et al., 2020).

c. Strategic Risk.

Strategic risk is a risk that can affect corporate exposure and strategic exposure as a result of strategic decisions that are inconsistent with the external and internal business environment. Strategic risk consists of strategic transaction risk, investor relations transaction, and business risk (Huang et al., 2022).

d. Externality Risk.

Externality risk is the potential for distorted results on corporate and strategic exposures and can have an impact on potential business closures, due to the influence of external factors. External risk consists of reputation risk, environmental risk, social risk, and legal risk (Gonçalves et al., 2021).

2. Technological Development

Information technology is a set of tools that help humans work with information and perform tasks related to information processing. Information Technology is made to make it easier for humans to exchange information. At first, this technology was used as a substitute for conveying information manually by word of mouth. With the development of science, this information technology can convey information with a lot of capacity, quickly and can be stored for a long time (Dwivedi et al., 2023).

According to Martin, information technology is not only limited to computer technology (hardware and software) that will be used to process and store information but also includes communication technology to send/distribute information. This opinion is also the same as explained by Williams and Sawyer, that information technology is a technology that combines computers with high-speed communication lines that carry data, voice, and video (Li et al., 2022).

However, there are differences in understanding when looking in more detail from the point of view of communication technology. If you look at the notion of communication technology, namely everything related to the use of assistive devices to process and transfer data from one device to another. From this definition, it can be stated that information technology is closely related to technology that has similarities in the delivery of information, processing, manipulation, management, and transfer of information between media (Nadler, 2020).

Currently, information and communication technology has developed to be able to connect several media such as television, computers, cellular phones, and many more. As with today's computers, one computer can connect to another computer thanks to the internet network (Lee et al., 2021).

According to the Kalakota cited by Dennis Darmawan, the internet is a network of many networks, connecting computers around the world. The emergence of the internet is inseparable from the need for telecommunication

and information that can be delivered quickly. Drew Heywood explained that the history of the Internet began in the late 60's when the United States Department of Defense (DoD) needed a new standard for Internet working communications. The standards are used to link universities, military contractors, and research bodies (Kumar et al., 2022).

Knowing the importance of communication networks, in 1969 a body was formed specializing in research on internet networks, namely the ARPANET. Since then the internet network has grown so that it can connect several computers in British and Norwegian universities. The development of information technology in the West also affects Indonesia. In Indonesia, the internet started to enter around the 90s, where previously it was only used by a few groups (Paloque-Bergès & Schafer, 2019). However, for the last few years, the internet has been accessible to almost every part of Indonesia. The internet has several facilities that make it easier for humans to communicate and find information. These facilities include browsing, email, mailing lists, inter relay chat, teleconference, news groups, file transfer protocols, internet telephony, and internet fax (Redjeki & Affandi, 2021).

C. METHOD

The research method that will be used in this research is a qualitative approach using a literature study. A qualitative approach was chosen because this study aims to analyze technology-based financial risk management strategies by exploring an in-depth understanding of the phenomenon and interpreting existing data. To carry out this research, the data sources to be used are various research results and previous studies that are related to technology-based financial risk management strategies. Sources of this data include scientific journals, articles, books, and related publications that are relevant to this research topic. By collecting data from various sources, it is hoped that a comprehensive understanding of the latest developments in technology-based financial risk management can be obtained. After the research data is collected, the next step is to process the data. The data processing process includes the analysis and synthesis of the information contained in the data sources that have been collected. Through the analysis process, it is hoped that new findings and insights that are relevant to the research objectives can be found. In this study, the literature study method is used as an effective approach to gain an in-depth understanding of the latest developments in technology-based financial risk management. By collecting data from various relevant sources, careful analysis, and synthesizing the information found, it is hoped that this research can make a significant contribution to the understanding and development of financial risk management strategies (Nasution, 2023).

D. RESULT AND DISCUSSION

1. Technological Developments in Financial Risk Management

Technological developments have had a significant impact on financial risk management. In this context, three important aspects are the main focus, namely the application of artificial intelligence, the use of data analytics, and the role of blockchain technology.

First, the application of artificial intelligence in financial risk analysis has changed the way companies manage risk. Through sophisticated AI algorithms and models, risk analysis can be carried out more efficiently and accurately. AI can process data in real-time and provide in-depth insights into possible financial risks. This allows companies to respond more effectively to changes in risk and optimize their financial performance.

Second, the use of data analytics has become an important instrument in identifying and mitigating financial risks. By leveraging advanced data analysis techniques, such as machine learning and data mining, companies can identify potential risks before they become serious problems. Data analytics allows companies to leverage historical and real-time data to identify risk trends and patterns. With a better understanding of the risks faced, companies can design more effective and adaptive risk management strategies.

Third, blockchain technology has contributed to increasing transparency and security in managing financial risks. With this technology, financial information can be recorded in the blockchain which cannot be changed and verified by all parties concerned. This reduces the risk of data manipulation and fraud. Blockchain technology uses strong encryption to protect transaction data from security threats. In addition, blockchain technology also enables better collaboration between related parties in managing financial risks.

By leveraging the application of artificial intelligence, the use of data analytics, and blockchain technology, companies can improve efficiency, accuracy, and security in managing financial risk. The existence of AI in risk analysis helps make better and faster decisions. Data analytics allows companies to gain a deeper understanding of market behavior and risk patterns that can affect financial performance. Meanwhile, blockchain technology provides transparency and security in managing financial risks by creating a decentralized system and an immutable audit trail.

To optimize technology-based financial risk management, companies need to pay attention to the challenges that may arise. One of the challenges is the need for skilled human resources in implementing this technology. Adequate understanding and skills are required regarding the technology used, as well as good integration with existing systems. In addition, data security and privacy are also important things that need to be maintained in the application of technology in risk management.

Technological developments in financial risk management have provided great opportunities for companies to improve efficiency, accuracy, and security in managing risk. The application of artificial intelligence, the use of data analytics, and blockchain technology have opened up new potentials in financial risk management. By leveraging these technological advances, companies can better respond to risks, optimize financial performance, and ensure sustainable business continuity.

2. Technology-Based Financial Risk Management Strategy

The implementation of a technology-based financial risk management strategy has become the main focus of the company to optimize risk management. Three important points need to be considered in this strategy, namely the implementation of a technology-based integrated risk management system, the use of digital platforms for real-time risk monitoring and evaluation, and the use of algorithms and predictive models in making financial risk decisions.

First, the implementation of a technology-based integrated risk management system is an important step in the financial risk management strategy. This system enables companies to manage risk holistically, by integrating the process of identifying, evaluating, mitigating, and monitoring risks into one connected platform. With an integrated system, companies can manage risk more efficiently and effectively, and increase risk visibility throughout the organization. Second, the use of digital platforms is an important means of real-time risk monitoring and evaluation. Digital platforms enable companies to collect, store and analyze risk data in real-time. The resulting risk information can be accessed in real-time by various related parties, such as management, finance department, and business units. Thus, the company can respond to risks quickly and precisely according to the current business needs.

Furthermore, the use of algorithms and predictive models in making financial risk decisions is an important aspect of a technology-based risk management strategy. Predictive algorithms and models are used to analyze risk data, identify patterns, and predict possible future risks. With these algorithms and models, companies can make more informed and accurate risk decisions, and reduce the level of uncertainty in risk management. The implementation of a technology-based financial risk management strategy also provides several benefits for the company. First, efficiency in risk management can be increased through process automation and the use of algorithms that can process data quickly. Second, the use of digital platforms allows companies to track risks in real-time and make more timely decisions. Third, the use of algorithms and predictive models helps companies predict potential risks and design effective mitigation strategies.

However, the technology-based financial risk management strategy also faces several challenges. First, companies need to overcome barriers to integrating different systems and technologies in their infrastructure. This requires careful effort in designing an integrated and compatible technology architecture. Second, companies must ensure data security and privacy in using digital platforms and processing risk data. Data security and protection are important keys to maintaining integrity and trust in technology-based risk management. To optimize the implementation of a technology-based risk management strategy, companies need to take certain steps. First, companies must evaluate their business needs and goals and select the appropriate technology. Second, skilled human resources in implementing and managing risk technology need to be developed through training and skills development. Third, companies need to adopt a sustainable approach in technology-based risk management by updating systems and technology according to the latest developments.

A technology-based financial risk management strategy is an important step in optimizing corporate risk management. Implementation of an integrated risk management system, use of digital platforms, and utilization of predictive algorithms and models can provide significant benefits. However, challenges in system integration, data security, and human resource development must be overcome for the successful implementation of this strategy.

3. Advantages and Challenges in Technology-Based Financial Risk Management

Technology-based financial risk management provides several significant advantages, but also challenges that need to be overcome. The main advantage of technology-based risk management is efficiency and cost savings through the automation of financial risk processes. However, challenges to data security and privacy as well as difficulties in integrating different technology systems also need attention. Efficiency and cost savings are one of the main advantages of technology-based financial risk management. By automating risk processes, companies can reduce dependence on manual work that takes time and human resources. Processes such as data collection, risk analysis, and monitoring can be carried out automatically through integrated systems and algorithms. This reduces the risk of errors and speeds up response time in managing financial risks.

However, the application of technology in risk management also faces challenges that need to be overcome. The main challenge is data security and privacy. Financial risk management involves sensitive corporate data, such as financial information, customer information, and strategic information. Therefore, companies need to implement strong security measures to protect

data from security threats, cyber-attacks, and information leaks that can harm the company and its customers. In addition, the integration of different technology systems is also a challenge that needs to be overcome in technology-based risk management. Companies often have different systems and technology platforms for risk management, such as risk management systems, financial systems, and operational systems. Integrating these systems is complex and requires significant effort. Companies need to ensure system compatibility, smooth data flow, and continuous system integration to support effective risk management.

Furthermore, the complexity of technology implementation in risk management is a challenge that cannot be ignored. Implementation of new technology requires significant time, resources, and effort. Companies need to carry out careful analysis, and careful planning, and overcome resistance to change from employees. Technology integration also requires constant updating and maintenance to remain relevant and effective as technology evolves rapidly. To overcome these challenges, companies need to take certain steps. First, companies need to involve a team that is skilled and experienced in risk technology implementation. This team will be responsible for the planning, development, and management of technology systems. Second, companies need to conduct periodic security audits and implement strict security policies to protect sensitive risk data. Third, companies need to have clear strategies and plans for integrating different technology systems to operate efficiently.

Technology-based financial risk management provides advantages in terms of efficiency and cost savings through risk process automation. However, challenges to data security and privacy as well as difficulties in integrating different technology systems need to be overcome with appropriate measures. With a good understanding of the challenges and advantages that exist, companies can implement technology-based risk management strategies successfully.

4. Recommendations for the Development of a Technology-Based Financial Risk Management Strategy

The development of a technology-based financial risk management strategy requires several recommendations that can support successful implementation. This recommendation includes increasing organizational understanding and awareness of the benefits of technology in managing financial risk, developing a regulatory framework that supports the use of technology in risk management, and training and developing human resource skills in the use of technology in financial risk.

First, companies need to increase organizational understanding and awareness about the benefits of technology in managing financial risks. This can be done through education and outreach about the potential of technology to

increase efficiency, accuracy, and security in risk management. Companies need to hold training sessions, seminars, or workshops that involve various stakeholders, including senior management, finance department, and business units. Increased understanding will help organizations recognize the added value of technology in risk management and design appropriate implementation strategies.

Second, it is necessary to develop a regulatory framework that supports the use of technology in risk management. Clear and comprehensive regulations will provide a solid legal basis for the application of technology in financial risk management. The government and regulators need to collaborate with industry players and risk experts to develop a regulatory framework that takes into account aspects such as data security, privacy, transparency, and the ethics of using technology in risk management. A sound regulatory framework will provide legal certainty for companies and encourage wider adoption of technology in risk management.

Third, it is important to carry out training and development of human resource skills in the use of financial risk technology. Implementation of technology in risk management requires special skills, both in understanding the technology itself and in risk analysis and decision-making. Companies need to implement a comprehensive training program to improve employee understanding and skills in the use of financial risk technology. This training can cover aspects such as understanding algorithms, data analysis, risk management, and ethics and safety in the use of technology.

Furthermore, companies need to encourage collaboration and exchange of knowledge between various stakeholders in developing technology-based risk management strategies. This collaboration can involve academic institutions, technology companies, financial institutions, and regulators. The exchange of knowledge and experience will enrich the understanding of the use of technology in risk management and accelerate innovation. Companies can hold discussion forums, conferences, or cross-sector meetings to facilitate collaboration and exchange of ideas. Then, the company needs to continuously evaluate and monitor the technology-based risk management strategy that has been implemented. This evaluation involves measuring the performance and effectiveness of the technology used in risk management. By monitoring and measuring results, companies can make the necessary improvements and adjustments to ensure the long-term success of their technology-based risk management strategy.

In addition, companies need to adopt a sustainable approach to developing technology-based risk management strategies. Technology continues to develop rapidly, so companies need to keep up with the latest developments and adapt to the changes that occur. Companies can form special teams or units

that are responsible for overseeing technology trends, conducting experiments, and implementing innovations in risk management. By staying focused on innovation and adaptation, companies can continuously improve their risk management performance. The development of a technology-based risk management strategy requires recommendations that support successful implementation. Increasing organizational understanding and awareness, developing a supportive regulatory framework, training and developing human resource skills, collaboration and knowledge exchange, evaluation and monitoring, and a sustainable approach are key steps in developing an effective technology-based risk management strategy. By following these recommendations, companies can optimize the use of technology in managing financial risks and achieve a competitive advantage in the digital era.

E. CONCLUSION

In an era of rapid technological developments, technology-based financial risk management provides both opportunities and challenges for companies. From the discussion above, it can be concluded that implementing a technology-based risk management strategy provides several advantages, such as operational efficiency, cost savings, and increased accuracy in risk analysis. The use of technology also enables real-time risk monitoring, informed decision-making, and increased transparency in managing financial risks. However, technology-based risk management also faces challenges that need to be addressed. Data security and privacy are becoming important issues in technology implementation, and companies need to implement strong security measures to protect sensitive risk data. In addition, the complexity of the integration of different technology systems and the difficulty in developing human resource skills in the use of risk technology must also be considered. To develop an effective technology-based risk management strategy, companies need to increase organizational understanding and awareness of the benefits of technology in managing financial risk, develop a regulatory framework that supports the use of technology, and carry out training and development of human resource skills in the use of financial risk technology. Collaboration between various stakeholders, continuous evaluation and monitoring, and a sustainable approach are also key steps in the development of a successful technology-based risk management strategy.

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