

Application of Artificial Intelligence Based Risk Management in Banking: A Systematic Literature Review

Benediktus Rolando¹, Herry Mulyono²

^{1,2)}Management Study Program, Faculty of Business and Management, Universitas Dinamika Bangsa
e-mail: benediktus@unama.ac.id, herrymulyono@unama.ac.id

Abstract

The application of artificial intelligence and machine learning in the banking industry has gained significant attention in recent years. This paper aims to conduct a systematic review of the existing literature on the application of AI-based risk management in the banking sector especially in Indonesia. Thi research utilized desk methodology approach to summarize the development and implementation of AI in financial risk management. The review follows a structured approach to identify, analyze, and synthesize the key findings from relevant studies. The review covers the benefits, challenges, and potential future research directions in this domain. We found that AI-based risk management can provide significant improvements in areas such as credit risk assessment, fraud detection, and regulatory compliance. However, the adoption of AI in banking also comes with its own set of challenges, such as data availability, model interpretability, and ethical considerations. Findings from this review can guide both academics and practitioners in understanding the current state of AI-based risk management in banking and inform future research and implementation efforts.

Keywords: *Artificial Intelligence; Risk Management; Banking Sector; AI-Based Risk Management.*

INTRODUCTION

In the current digital era, the banking industry faces increasingly complex risk management challenges. As a highly regulated sector, banks must continually innovate to reduce risk, comply with regulations and remain competitive. One of the biggest innovations that is changing the risk management paradigm is the use of artificial intelligence (AI). AI has become a key element that enables banks to identify, analyze and manage risks more efficiently and effectively. Risk management itself is a systematic approach to identifying, assessing and managing risks in order to reduce potential negative impacts that can affect the achievement of organizational goals. Risks can arise from a variety of sources, including market changes, policy changes and unexpected events. The aim of risk management is to identify the risks that an organization may face, assess the impact and likelihood of those risks occurring, and develop strategies to overcome them. Before AI was introduced, risk management in the banking sector was usually based on a manual approach that required many human processes. This often took a lot of time, limited scalability, and was prone to human error. However, advances in AI technology have enabled banks to use intelligent algorithms to analyze large amounts of data in a short time. AI can also perform deeper and more complex analyzes and provide more accurate and timely insights. AI is a technology designed to understand and model human thought processes and design machines so that they can imitate human behavior (Supriadi & Asih, 2020). With AI technology being created to be able to carry out activities like humans, it has become a concern for people's lives as AI can carry out legal actions or the same legal acts as humans can (Elwanda Yudistira, 2015). AI is a technology that requires data to become knowledge, just like humans. AI can be applied in various ways by focusing on machine intelligence so that it can respond like humans. For the financial sector, technological innovation is actually not a new phenomenon, because technology and finance have a long history of symbiosis so that inherently financial technology or what is more popularly known as FinTech, is also a new development for the financial services industry.

Artificial Intelligence (AI) has extraordinary data analysis capabilities. Using machine learning algorithms, AI can manage and analyze data at scale to identify patterns, trends and anomalies that may be indicators of risk. AI in risk management refers to the use of artificial

intelligence technology to identify, assess and manage the risks that an organization will face. One of the main advantages of AI in risk management is its ability to detect risks in real-time. AI systems can monitor changes in the business environment and markets quickly, enabling organizations to respond quickly to changing conditions. The role of AI in the Indonesian banking sector is related to the emergence of the open banking trend, which reflects a shift from closed banking. Open Banking is working with new mobile-focused partners. Even if AI impacts innovation in the banking industry, this does not rule out the possibility that the development of open banking could have a negative impact on areas such as cybersecurity. In the banking world, AI enables back-office, middle-office, front-office and channel optimization. The biggest impact will occur in the middle office, where AI will play a role in risk management.

AI, which is growing rapidly, can become a medium that facilitates various business sectors, including the financial or banking sector. According to Banking Law Number 10 of 1998, it is explained that "Banking is something related to banks, including institutions, business activities as well as methods and procedures in carrying out operational activities. The first plan for activities in banking was carried out offline, face to face. However, this is considered ineffective and inefficient, requiring a long time, operational effectiveness and also safety. Thus, when the industrial revolution occurred, AI contributed efficiency to public activities such as in the banking sector and other financial institutions. various financial transactions of customers and prospective customers can be served effectively and efficiently. Artificial intelligence (AI) based risk management is interesting to discuss because this technology brings significant changes in the way companies and organizations manage risk. AI enables data analysis at scale quickly and accurately. This allows companies to identify risk patterns that may be difficult to find manually and helps identify unexpected risks. By using AI in risk management, the risk of human error can be reduced. AI systems can work without fatigue and without the influence of emotions, which can often influence human decisions.

In the banking sector which involves various complex services and transactions, including credit, investment and other financial services. AI can help banks manage risk in these various aspects more efficiently and effectively. Banking is vulnerable to various types of financial crimes such as credit card fraud, money laundering, and other finance-related crimes because AI systems detect suspicious patterns and provide early warnings. In service, AI improves the customer experience by making it safer and more reliable for customers. So using AI in risk management can increase operational efficiency, reduce costs and optimize the processes involved in risk management. Banks can also increase their resilience to complex and diverse risks that may arise in a dynamic business environment. The use of AI can help banks identify and manage technology risks, including cybersecurity risks.

The main goal of AI in risk management is to identify risks quickly, be able to process and analyze large volumes of data quickly, enabling risk identification more accurately and quickly compared to manual approaches. Predictive Analytics and Forecasting can use predictive analytics models to predict market trends, regulatory changes, or other factors that may impact an organization's risk. Decision Making Automation with AI systems can provide decision recommendations based on in-depth data analysis, helping managers make more precise and effective decisions. Business Process Optimization using AI can automate routine tasks in risk management, freeing up time and resources to focus on more complex strategic decisions and risk management.

Suspicious Risk Detection AI systems can detect suspicious patterns and behavior in transaction data or business activity, helping prevent or respond quickly to fraud. Proactive Risk Management with real-time data analysis, AI can help organizations identify potential risks as soon as they arise, enabling faster preventative action. Portfolio Optimization and Investment Decisions can help in selecting and managing investment portfolios based on risk and financial objectives, as well as responding dynamically to market changes. System Security Enhancement is used to detect cyber attacks and suspicious activity, improving system and data security. Efficiency in Regulatory Compliance helps in monitoring and compliance with regulations related to risk management, ensuring that organizations comply with applicable standards and regulations.

THEORETICAL REVIEW

Risk Management Context

Risk is something that is not certain to happen from an event, which can give rise to the possibility of loss or harm from an act or action taken. In organizations, risks can be prevented by implementing risk management. Risk management is a structured approach to identifying, assessing, managing and monitoring risks in an organization or project. This risk management involves a series of steps to identify potential threats or opportunities, assess their impact, and create strategies to manage these risks. In simple terms, the definition of risk management according to Djojosoedarso (2003:4) is the implementation of management functions in overcoming risks, especially risks faced by organizations/companies, families and communities. So it includes planning, organizing, compiling, leading/coordinating and supervising activities including evaluating risk management programs. Based on the understanding of Hanafi (2009:9) and Rustam (2013:44), the dimensions used to measure risk management are the risk management process which consists of risk identification, risk measurement, monitoring, risk and risk control.

The main aim of risk management is to protect and ensure that the organization or company can analyze, see and control risk opportunities that may occur. Risk management helps an organization understand the risks it faces and how to manage them effectively. In doing so, organizations can reduce uncertainty, make better decisions, protect assets and people, and achieve their goals. In addition, risk management also helps organizations comply with laws and regulations, and improve operational efficiency and effectiveness. This risk management is an important part of planning that must be carried out by every organization. With risk management, organizations are more effective and can reduce the negative impact of the threats they face and create a safer and more stable business environment.

Financial institutions

Financial institutions are all bodies that, through their activities in the financial sector, withdraw money from and distribute it to society, this is taken from Article 1 of Law no. 14 of 1967. According to the Decree of the Minister of Finance of the Republic of Indonesia No. 792 of 1990, financial institutions are all bodies whose activities revolve around the financial sector, such as collecting and distributing funds to the public, especially to finance company investments. In this regulation, financial institutions are prioritized for financing company investments, but this does not mean that financial institutions' financing activities are only for company investments. In reality, financial institutions' business activities can be aimed at corporate investment, consumption activities, and distribution of goods and services. According to Dahlan Siamat, a financial institution is a business entity whose wealth is mainly in the form of financial assets or claims compared to non-financial assets or real assets. Financial institutions provide financing/credit to customers and invest their funds in securities. Apart from that, financial institutions also offer various financial services, including offering various types of savings schemes, insurance protection, pension programs, providing payment systems and fund transfer mechanisms.

Kasmir defines financial institutions as companies operating in the financial sector that collect funds, distribute funds, or both. This means that the activities carried out by financial institutions are always related to the financial sector, whether these activities are solely collecting funds, only distributing funds, or both collecting and distributing funds.

Artificial Intelligence

In the current modern era, there is rapid technological development and technological developments, one of which is the emergence of artificial intelligence technology. Artificial Intelligence (AI) is a term used to model intelligent behavior and critical thinking comparable to humans using computers and technology. AI is a technology developed to understand and model human thought processes and design machines so that they can imitate human behavior (Supriadi & Asih, 2020). Artificial intelligence imitates human cognitive functions which are used to solve problems, by learning and thinking like humans. AI involves developing systems that can think, find meaning, generalize, or learn from past experiences. AI combines computer science with

powerful datasets to enable problem solving and includes sub-fields such as machine learning and deep learning. AI can be categorized into several types. The first type is reactive machines, which are the most basic form of AI. These machines can react to certain situations but have no memory or ability to learn from past events. The second type is a machine with limited memory, which has a limited understanding of past events and can use that information to make decisions. The third type is machines with theory of mind understanding, which have the ability to understand and attribute mental states to other people, allowing them to interact and communicate effectively. The fourth type are self-aware machines, which have awareness and understanding of their own existence.

Since the development of digital computers in the 1940s, it has been proven that computers can be programmed to perform complex tasks with great proficiency. However, there is still no program that can match the flexibility and knowledge of humans in various domains. Despite this, AI has achieved significant progress and is used in various applications such as medical diagnosis, computer search engines, voice or handwriting recognition, and chatbots. The field of AI focuses on different components of intelligence, including learning, reasoning, problem solving, perception, and language use. Learning in AI can take various forms, such as learning through trial and error or generalization, which involves applying past experiences to new situations.

Machine learning plays an important role in training computers to learn from input without explicit programming for each state, ultimately contributing to the achievement of artificial intelligence. However, artificial intelligence cannot completely replace the role of humans, this is because humans have empathy that a system cannot have. On the other hand, artificial intelligence can support human performance. Artificial intelligence has now been widely applied to help all human activities, including the industrial manufacturing sector with the automated use of robots.

AI in bank financial institutions

In the era of digitalization, banking financial institutions also face new challenges in dealing with technological developments. They have to adapt to technological changes and expand their services into the digital realm. Banking financial institutions must also maintain the security of customer data and protect them from the threat of cybercrime.

One of the technological developments that can be applied is Artificial Intelligence (AI), where AI itself has become a technology that is changing the way banking financial institutions operate. In today's digital era, banking financial institutions are increasingly adopting AI to increase efficiency, improve customer experience and optimize decision making. In the context of banking financial institutions, AI is used in various aspects, including risk analysis, customer service, credit assessment, fraud detection, and investment.

One of the areas where AI is used in banking financial institutions is risk analysis. By leveraging AI, financial institutions can analyze historical data and identify patterns and trends that can be used to predict credit risk or market risk. AI can help in identifying potential risks that traditional analysis methods may miss. Thus, financial institutions can take appropriate actions to manage risks more effectively.

Apart from that, AI is also used in customer service. By using chatbots, financial institutions can provide responsive and efficient customer service. AI chatbots can provide instant answers to common customer questions, assist in the account opening process, provide information about products and services, and direct customers to the right department if necessary. With the adoption of AI in customer service, financial institutions can increase customer satisfaction and reduce the response time required.

AI also has an important role in credit scoring. In the traditional credit assessment process, financial institutions rely on manual analysis of a customer's financial documents and credit history. However, with the adoption of AI, financial institutions can use algorithms and machine learning to automatically analyze data and provide more accurate credit assessments. AI can analyze factors such as credit history, income, and assets to help financial institutions make better and faster credit decisions. Apart from that, AI is also used in fraud detection. In an effort to reduce the risk of fraud, banking financial institutions use AI to analyze suspicious patterns and behavior. AI can identify unusual transaction patterns or suspicious activity and provide alerts to financial

institutions. With the adoption of AI in fraud detection, financial institutions can reduce losses caused by illegal activities and protect customer interests.

Apart from that, AI is also used in investment management. Banking financial institutions use AI to analyze market data, investment trends and customer risk profiles to provide more accurate investment advice. With the adoption of AI in investment management, financial institutions can provide portfolios tailored to customers' goals and risk profiles. AI can also help in carrying out automated trading and optimizing investment portfolio performance.

However, with the adoption of AI in banking financial institutions also come challenges and risks. One of the main challenges is data security and privacy. In using AI, financial institutions must ensure that customer data stay safe and protected from cybercrime threats. They must implement strong security measures and comply with applicable regulations to protect customers' personal information. Regulation is also an important factor in the adoption of AI in banking financial institutions. Because AI involves the use of customer data, financial institutions must comply with applicable regulations regarding privacy and data use. They must ensure that their use of AI complies with applicable privacy policies and regulations.

In conclusion, AI has changed the way banking financial institutions operate. In today's digital era, AI is used in various aspects such as risk analysis, customer service, credit assessment, fraud detection, and investment management. With the adoption of AI, financial institutions can increase efficiency, improve customer experience, and optimize decision making. However, challenges such as data security and privacy as well as regulations remain to be overcome to ensure sustainability and trust in the use of AI in banking financial institutions.

Industry 4.0

Industry 4.0 is a term used to describe the industrial revolution currently occurring as a result of the development of digital technology and increasing connectivity. Industry 4.0 involves the use of technologies such as the Internet of Things (IoT), big data, artificial intelligence (AI), robotics, and digital-based manufacturing to create smarter, more efficient, and digitally connected production systems. One of the main aspects of Industry 4.0 is extensive connectivity between machines, devices and systems in the production chain. Through the use of IoT, devices and machines can connect with each other and share data in real-time. This allows companies to collect and analyze data at scale to gain better insight into their operations. This data can be used to increase efficiency, optimize production, and identify improvement opportunities.

Apart from that, Industry 4.0 also involves the use of big data to collect, store and analyze large amounts of data. This data can come from a variety of sources, including production machines, sensors, user devices, and other digital platforms. By analyzing this data, companies can identify patterns, trends, and insights that can be used to make better decisions. For example, production data can be used to predict machine failures or optimize production schedules.

Artificial intelligence (AI) also plays an important role in Industry 4.0. AI allows machines and systems to learn, adapt, and make decisions automatically based on collected data. For example, in manufacturing, AI can be used to optimize production processes, identify product defects, or rearrange production schedules based on customer requests. AI can also be used to increase energy efficiency, reduce waste, and improve product quality. Robotics is also an important component of Industry 4.0. Robots can be used in a variety of functions, from automated production to logistics and delivery. Robots can work efficiently and accurately in hazardous or repetitive environments, reducing the risk of accidents and increasing productivity. In addition, robots can also work together with humans in collaborative systems, combining human strength and machine accuracy to improve production efficiency and quality.

Digital-based manufacturing is also an important part of Industry 4.0. In digital-based manufacturing, the entire supply chain is digitally integrated, from product design to delivery to customers. Manufacturing processes can be automated and connected in real-time with other systems, such as inventory management, shipping, and maintenance. This allows companies to increase flexibility, reduce production costs and increase the speed of response to market changes. In addition to changes in production processes, Industry 4.0 also has a significant impact on the workforce. The development of digital technology and automation can change labor needs and influence the types of jobs available. Some jobs may be replaced by machines or AI, while new

jobs requiring digital and analytical skills may emerge. Therefore, appropriate education and training are crucial in facing these changes and preparing the workforce for Industry 4.0. Industry 4.0 also has a broad impact on various economic sectors. In the manufacturing sector, Industry 4.0 can increase efficiency, reduce production costs, and enable mass production tailored to customer needs. In the energy sector, IoT and big data can be used to optimize energy use and increase efficiency. In the transportation sector, the use of autonomous technology and connectivity can improve safety, efficiency and customer experience.

METHOD

This study utilized a secondary research approach. A desk study design is widely recognized as a form of secondary data collection, which involves gathering data from existing sources, often preferred for its cost-effectiveness compared to primary field research. The current study examined a comprehensive range of previously published studies and reports that were readily accessible through online academic journals, databases, and libraries. This approach allowed for a thorough analysis of the existing literature on the topic, providing a strong foundation for the research findings.

RESULTS AND DISCUSSION

The Role of Artificial Intelligence in Risk Management in Financial Institutions

Artificial Intelligence (AI) plays a very important role in risk management in financial institutions. In the context of financial institutions, risk management is the process of identifying, evaluating and controlling risks related to financial activities. The use of AI in risk management helps financial institutions identify potential risks, manage risks more effectively, and make better decisions in risk management. One of the main roles of AI in risk management is data analysis. AI enables financial institutions to analyze large-scale and complex data quickly and accurately. With better data analysis, financial institutions can better identify potential risks and take appropriate actions to manage those risks.

Additionally, AI can also be used to predict potential risks. By using machine learning techniques, AI can develop predictive models that can identify potential future risks. For example, financial institutions can use AI to predict credit risk based on customer credit history, economic data, and other relevant factors. With more accurate risk predictions, financial institutions can take appropriate actions to reduce credit risk and better manage portfolios. Fraud detection is also an important role of AI in risk management. AI can be used to detect fraud or suspicious activity in financial transactions. Using machine learning techniques, AI can learn normal transaction patterns and identify unusual or suspicious patterns. With better fraud detection, financial institutions can reduce losses caused by illegal activities and protect customers' interests.

Portfolio management is also an area where AI can play a role. AI can be used in investment portfolio management to identify opportunities and manage risks. By using machine learning techniques, AI can analyze market data, investment trends and customer risk profiles to provide more accurate investment advice. With better portfolio management, financial institutions can optimize asset allocation, reduce risk and improve portfolio performance. Apart from that, AI also helps in making decisions related to risk management. By using advanced machine learning and data analysis techniques, AI can provide relevant and accurate information to decision makers. AI can help in identifying potential risks, calculating the probability of the risk occurring, and providing recommendations for appropriate action. With AI support in decision making, financial institutions can reduce human bias and increase accuracy in risk management.

Risk monitoring and monitoring is also an important role for AI. AI can be used to monitor and monitor risks continuously. Using machine learning techniques, AI can collect and analyze data in real-time to identify changes in market conditions or suspicious behavior. With better monitoring, financial institutions can respond quickly to risks and reduce their possible impact. Lastly, AI can also be used to automate risk management processes within financial institutions. For example, AI can be used to automate credit analysis, market risk evaluation, or compliance monitoring. By automating processes, financial institutions can increase efficiency, reduce costs, and reduce the risk of human error.

However, keep in mind that the use of AI in risk management also has its own challenges and risks. Data security and privacy are one of the main challenges. Financial institutions must ensure that customer data remains safe and protected from the threat of cybercrime. Apart from that, ethics in the use of AI also need to be considered, such as transparency and accountability in decision making involving AI. In conclusion, AI has a very important role in risk management in financial institutions. With advanced data analysis, accurate risk predictions, better fraud detection, effective portfolio management, informed decision making, continuous supervision and monitoring, and process automation, financial institutions can better manage risks and reduce losses caused by financial risk.

The Role of AI in Financial Institutions

Artificial Intelligence (AI) is a form of digitalization progress which has the capacity and expertise of industry in carrying out its business activities and also helps to achieve maximum efficiency for the industry. In the banking sector, the existence of Artificial Intelligence is useful for maximizing digital security procedures and also minimizing crimes of manipulation or fraud. AI can also be used to maximize a company's profit level by replacing humans with systems in addition to minimizing costs, reducing human error, and also shifting costs to improve products according to customer needs. The use of AI in the financial industry can solve customer problems, for example interactions with customers and service providers, answering or serving customer problems, and can also minimize long queues caused by manual system performance. In making decisions in AI, previous research has applied decision support systems to determine bank customer financing. With AI, it is hoped that banks can carry out procedures to assist management in making decisions on target debtors, although the final decision remains in the hands of managers, AI is used to make things easier, more efficient and minimize errors. In accordance with the results of previous research, the financial industry can imitate the flow of financing schemes through the use of technology that can minimize financing risks. Implementation of AI regarding customer service, for example the use of chatbots. Banks that have this service application include Vira belonging to Bank BCA, MITA belonging to Bank Mandiri, Sabrina belonging to Bank BRI, Cinta belonging to Bank BNI, Amy belonging to HSCB Bank and Emma belonging to Bank OCBC as well as various other banks. The use of AI in the financial industry can help convey information quickly, precisely and accurately. In this way Artificial Intelligence can function in Risk Management. This is because AI can minimize losses or errors when disbursing loans to bank customers, apart from that, AI can also increase security during payments because it can detect fraud, as well as optimize compliance with regulations and maximize customer targets for financial agency products.

Benefits and Drawbacks of AI Implementation In Risk Management

Implementing Artificial Intelligence (AI)-based Risk Management in the banking sector can have a number of positive impacts, which can increase operational efficiency and the ability to identify and manage risks. The following are some of the positive impacts that will occur: First, using AI can help banks simplify the risk management process. This can increase efficiency related to risk management. Second, AI technology can be used to analyze transaction behavior directly. Banks can more quickly detect and prevent misuse of improper transactions such as fraud, protect the interests of customers or banks and can analyze historical data to predict risks more accurately. Third, AI can help banks to optimize portfolios well and manage portfolio risks more effectively. Fourth, AI can also analyze large proportions of data and identify complex patterns and provide insights that are difficult to obtain. Fifth, AI technology provides more complete information, AI-based risk management can support better decision making. The six applications of AI can reduce costs by automating tasks that previously required quite a long time and human resources to complete more easily and quickly. It is important that the successful implementation of Artificial Intelligence Based Risk Management depends on a good understanding of the technology, continued training of the AI model and constant monitoring to ensure appropriate and maximum performance.

Although Artificial Intelligence (AI) Based Risk Management can have a positive impact, there are also potential negative impacts that need to be considered and managed properly. Some of the negative impacts that may arise include; First, the application of AI in risk management can make banks dependent on technology. In the event of an AI system failure, banks may have difficulty managing risk properly. Second, AI technology in risk management involves sensitive data. If the data is not properly secured, privacy violations and data misuse can occur. Banks need to ensure that AI systems have security measures strong enough to protect user data and prevent cyber attacks. Third, decisions taken by AI can raise ethical issues, especially in the context of decisions that have a large impact on individuals or groups within the company. Fourth, implementing AI-based risk management requires special technical expertise. Skills gaps within an organization or company, among risk management personnel, can be a challenge in managing AI systems. Fifth, the use of AI technology is still developing, and organizations must monitor regulatory changes to ensure compliance. This uncertainty can create challenges in planning and implementation. Sixth, implementing and maintaining AI systems can require significant investment. These initial costs can be prohibitive for some organizations. Seventh, human actors such as intuitive judgment and experience are also important. If banks rely too much on AI, there may be a tendency to ignore human contributions in the decision-making process. This can remove the important human element of risk management. It is important for banks to consider and manage these negative impacts wisely when implementing AI-Based Risk Management. Banks must maintain a balance between the use of AI technology and the role of humans in managing risk well.

CONCLUSION

Based on the research results and discussion, the conclusion is that AI has an important position for banking in Indonesia. Every banking industry definitely uses and implements risk management. Risk Management is the implementation of policies and procedures such as carrying out analysis, identification, evaluation and control to overcome risks that will be faced by an organization or company. Organizations or companies that implement risk management can track all potential sources of risk through information about the sources of risk. With a risk management process, companies can deal more quickly with various sources that threaten the growth of a business. In today's era, it can be made easier for the banking industry to face increasingly complex risk management challenges. The banking industry must continue to innovate in order to be able to face and reduce these complex risks and remain competitive, namely with one of the major innovations through the use of artificial intelligence. AI or Artificial Intelligence, helps banks to identify, analyze and manage risks more efficiently and effectively. Before the advent of AI, risk management in the banking sector was based on a manual approach that took a lot of time and was prone to human error. But with advances in technology and the existence of AI, it is possible for banks to use intelligent algorithms to analyze large amounts of data in a fairly short time. AI can also perform deeper and more complete analysis and provide more accurate and timely insights. AI in risk management can detect risks in real-time and can enable companies to respond quickly to changing conditions.

In the banking sector in Indonesia, AI has a role in optimizing the back office, middle office, front office and channels. AI also contributes to the efficiency of public activities such as in banking and other financial institutions by serving customer financial transactions in an effective and efficient manner. AI in risk management aims to identify risks quickly and analyze large amounts of data quickly, making it possible to identify risks accurately and quickly compared to manual approaches. AI can also detect suspicious risks in behavior, data or activities in conducting business or business. Before using AI, you must ensure that the related procedures and regulations comply with ethics and a sense of responsibility for this matter. Organizations or companies must see the positive and negative impacts and challenges of AI before implementing it and must consider it so that undesirable things do not happen.

The application of AI-based risk management in the banking industry has enormous potential to improve operational efficiency, reduce operational risks, improve security, and develop

innovative products and services. With AI's ability to analyze data quickly and accurately, banks can identify, measure and control risks more efficiently, enabling better and faster decision making. In addition, the use of AI can also reduce operational risks caused by human error, increasing the reliability and security of bank operations. In terms of security, AI can detect and prevent fraudulent activities and financial crimes, protect customers and maintain the integrity of the financial system. Apart from that, the application of AI in risk management also opens up opportunities for banks to develop innovative products and services, by providing more personalized services and optimizing portfolios through more accurate risk prediction models. In an increasingly complex digital era, the application of AI in risk management is becoming increasingly important for banks to remain competitive and maintain competitive advantage. However, of course, the application of AI must also pay attention to the security and privacy aspects of customer data. Thus, the application of AI-based risk management in banking has promising implications and potential for the future.

The application of AI-based risk management theory concepts in the banking industry has very interesting implications and future potential. First of all, the use of AI in risk management can improve the operational efficiency of banks. With AI's ability to analyze data quickly and accurately, banks can identify, measure and control risks more efficiently, enabling better and faster decision making. Apart from that, the application of AI in risk management can also reduce operational risks caused by human error. AI can perform routine and repetitive tasks with high precision, reducing the possibility of human error that can cause financial loss. In this way, banks can improve the reliability and security of their operations.

SUGGESTIONS

The use of AI can also improve banking security by detecting and preventing fraudulent activities and financial crimes. Through technologies such as machine learning and pattern analysis, AI can identify suspicious patterns and provide early warnings to banks. This helps banks protect their customers and maintain the integrity of the financial system. Furthermore, the application of AI in risk management can open up new opportunities for banks to develop innovative products and services. With AI's ability to analyze customer data and provide tailored recommendations, banks can provide more personalized service to customers. Additionally, AI can also be used to develop more accurate risk prediction models, helping banks make smarter decisions and optimize their portfolios. In order to face challenges in the digital era, the application of AI in risk management is becoming increasingly important. Banks need to adopt this technology to remain competitive and maintain a competitive advantage. However, of course, the application of AI also needs to pay attention to the security and privacy aspects of customer data.

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