Transformative Ability of Artificial Intelligence in Risk Management

Ambika Gurung

Degree Thesis

Bachelor’s Degree

2024

Degree Thesis

Ambika Gurung

Transformative ability of Artificial Intelligence in Risk Management

Arcada University of Applied Sciences: Bachelor’s Degree 2024

Abstract:

This research paper critically assesses how Artificial Intelligence (AI) is changing the way risk management is conducted. By using AI technologies companies can go beyond risk management approaches improving their ability to predict outcomes operate more efficiently and adapt strategically. The study delves into how AI's being integrated into risk management processes highlighting both the benefits and challenges. Through an examination that include, in-depth exploration of studies this research aims to offer valuable recommendations on how organizations can effectively utilize AI technologies to navigate complex risk landscapes. It establishes a framework for evaluating the impact of AI on risk management showing that AI powered systems greatly enhance real time data processing, accuracy in risk assessment and proactive management strategies. However, it also points out obstacles like transparency problems ethical dilemmas and the need, for oversight to ensure fairness and prevent biases. By synthesizing these insights, the paper emphasizes the importance of implementing AI in risk management to improve decision making processes and organizational resilience. The information shared enhances comprehension of how AI can transform risk management providing insights, for advancing theory and applying it in the field.

Keywords: Artificial Intelligence, Risk Management, Automation, SWOT analysis, Thematic analysis, Predictive analytics

Contents

1 Introduction

Artificial Intelligence represents a significant technological advancement, fundamentally altering how systems perceive, analyse and interact with their environment. Fuelled by enhancement in computational power, sophisticated algorithms and extensive data availability, AI has evolved from its initial conception aimed at simulating human cognitive abilities to a crucial driver of innovation across various sectors (Sokoli, 2023a). Today, AI's application extends beyond mere automation facilitating substantial improvements in decision making and operational efficiencies across industries. This broad applicability has made AI integral in addressing contemporary corporate challenges, such as market expansion, risk assessment and strategic management, thereby improving returns on investment and forecasting new business opportunities.

In risk management the impact of AI has been transformative. Traditional methods, often limited by the reliance on historical data and manual processes are being superseded by AI-driven systems capable of analyzing vast datasets to identify trends and predict potential threats in real time. This capability enables organizations to proactively manage risk, enhancing their resilience and decision-making processes. AI's predictive prowess is evident in various applications, from improving inventory accuracy in e-commerce to enhancing equipment maintenance in manufacturing and bolstering vehicle safety in automotive industry (Scott Clayton, 2023)

This thesis explores how AI reshapes risk management practices, delving into the mechanisms through which AI enhances risk analysis and decision-making. It also critically evaluates the potential challenges that could undermine the effectiveness of AI systems in this context. By integrating empirical research, this study aims to offer comprehensive analysis of AI's current application and its future potential in enhancing organizational risk management strategies. Ultimately, this thesis seeks to provide strategic insights and practical recommendation to help organizations effectively harness AI to navigate increasingly complex risk environments while addressing the challenges associated with integrating advanced technologies into existing frameworks.

1.1 Problem statement

This study delves into the task of examining how Artificial Intelligence (AI) can enhance risk management practices in the face of rapidly changing risk landscapes. As AI becomes more integrated across industries, there is still a gap in fully grasping its potential for effectively handling risks. Traditional risk management approaches often struggle to keep up with the evolving nature of businesses threats resulting in inefficiencies when it comes to identifying, assessing and mitigating risks. This research aims to investigate how AI can transform risk management by improving decision making processes and enhancing resilience it will also investigate the obstacles that organization encounter when implementing AI technologies with the goal of offering insights, into practices that can optimize the advantages of using AI in risk management.

1.2 Aim of the study

This research explores the significant impact of Artificial Intelligence (AI) on risk management focusing on three inquiries that seek to unravel the advancements and obstacles introduced by AI technologies in this domain.

RQ1. How does Artificial Intelligence (AI) enhance risk management practices?

RQ2. How do traditional risk management practices compare to those implemented with artificial intelligence?

RQ3. What are the main challenges associated with integrating AI into risk management?

These questions aimed to present a comprehensive analysis of AI’s role in reshaping risk management approaches and addressing the obstacles to its effective integration, thereby providing an in-depth exploration of AI's potential to traditional method and enhance organizational resilience.

1.3 Demarcation

This thesis investigates the practical applications of artificial intelligence (AI) in enhancing risk management strategies within businesses. The research will focus on reasons behind AI adoption, its effectiveness in risk identification and mitigation, and both the benefits and challenges encountered in its implementation. Additionally, it will explore the anticipated future developments and opportunities in AI driven risk management.

The study will deliberately explode in-depth technical analysis of AI development, such as programming specifics or algorithmic design, to concentrate on the tangible impacts of AI applications in real-world business scenarios. This approach ensures the research remains accessible to a broad audience, including risk management practitioners and stakeholders, without delving into technical complexities that might obscure the practical insights. By focusing on how AI is utilized in the field and its implications for businesses, the research aims to provide valuable insights that enhance understanding and support strategic decision-making in risk management.

2 Theory

This section is strictly linked to the theoretical background of the study, specifically emphasizing the critical role of Artificial Intelligence (AI) in enhancing risk management strategies. It constructs the essential theoretical framework required for a detailed thematic analysis and SWOT analysis. These analyses are crucial for a deep comprehension of both the present conditions and future prospects for AI applications within this domain. Through methodical investigation of these elements, the aim is to develop a solid and analytical foundation. It will help to support the discussion anticipated in Chapter 5 and predict potential outcome associated with the adoption of AI in risk management. This structure analytical approach is designed to uncover and classify possible challenges and opportunities that may arise, hereby laying a strong base for the definitive conclusion of the thesis.

2.1 Concept of AI

In 1956, John McCarthy introduced the phrase “Artificial Intelligence,” characterizing it as a wide topic encompassing developments that allow machines to display intelligence. This includes several synonyms, including natural language processing (NLP), enhanced intelligence, deep learning, machine learning (ML), image recognition, cognitive computing and cognitive argumentation (Kunwar, 2019). Artificial intelligence is becoming more and more common in today's market, as many industries use algorithms to produce consistent results that improve customer service and sales, which in turn increase profitability. AI includes machine learning, which lowers errors caused by psychological and emotional factors. The ability of AI to examine large datasets, extract important insight and form conclusions is a core features of AI (Sokoli, 2023).

2.2 AI in different industries

The financial industry has embraced automation tools significantly with 67% of businesses using them to automate monotonous procedure and streamline daily operations, according to a study by (Hester, 2023). AI and machine learning algorithms have streamlined operations, reduced expenses, manage potential risk, and enhanced service standards (Naim, 2022). It has improved efficiency in areas such as investment management, automation trading, loan application and fraud monitoring (Naim, 2022).

Artificial Intelligence (AI) has become an indispensable tool across a multitude of sectors, including finance and healthcare, where its applications are tailored to meet specific needs (Kunwar, 2019). One such area where AI exceed in predictive maintenance, where its capability to analyze fast and diverse datasets, encompassing everything from image to audio recordings, plays a pivotal role (Kunwar, 2019). Artificial Intelligence is extremely useful in an area where efficiency and precision are crucial, including manufacturing and aviation. It can quickly identify irregularities in crucial systems like assembly lines or aircraft engines. Businesses may minimize downtime, cut costs, and improve overall potential performance by using AI-driven predictive maintenance to proactively handle possible issues before they worsen (Kunwar, 2019).

According to (Harry, 2023), Artificial Intelligence is significantly transforming the educational landscape by making learning more personalized, engaging and efficient. Using machine learning and natural language processing, AI facilitates tailored education experience by analyzing student data to identify learning patterns and predict needs, which allows for personalized learning paths. This customization helps improve student outcomes as learning learners can study at their own pace and style. Additionally, automated routine tasks like grading and assessment, enhancing teachers' efficiency and providing consistent immediate feedback (Harry, 2023).

Artificial Intelligence (AI) is significantly reshaping international logistic under the banner of "Logistic 4.0", optimizing supply chains and enhancing efficiency through data-driven decision making and process automation (Albarracín Vanoy, 2023). Integrating AI into educational curriculum, especially within international business and logistic fields, aims to enhance skill set tailored for technologically advanced environment. This strategic implementation of AI is crucial for boosting operational efficiency, reducing cost and promoting innovative practices in globalized business landscape (Albarracín Vanoy, 2023).

According to (Haleem et al., 2022), Artificial Intelligence (AI) is profoundly transforming the marketing landscape by enhancing data analysis and automating routine operations. This sophisticated technology encompasses a great range of capabilities from machine learning to natural language processing, enabling highly personalized marketing strategies. Moreover, by automating critical but repetitive task, AI liberates marketers to concentrate on more strategic initiatives (Haleem et al., 2022). In essence, AI not only streamlines marketing process but also infuses them with greater efficiency and effectiveness approving dispensable for competitive advantage in the dynamic marketing sector.

In study done by (Samala et al., 2022), Artificial Intelligence (AI) is dramatically transforming the travel, tourism and hospitality industry by optimizing service efficiency and customizing customer interaction. Key studies, such as those by Tata Consultancy Services and Google travel, revealed that 85% of service providers in these sectors now utilize AI. This technology enables features from interactive booking to tailor travel recommendations, with 74% of customers planning trip online and 45% via smartphones (Samala et al., 2022). This substantial adoption is driven by consumer

preference for technology-driven solutions and instantaneous service delivery. AI not only enhances operational efficiency but also specifically tailors travel experience to individual preferences, hereby significantly enhancing customer engagement and satisfaction across the tourism industry.

2.3 Risk management

Risk in management is defined as the uncertainty's impact on objectives, potential leading to positive, negative or mixed outcomes, with the severity of these outcomes guiding risk assessment and mitigation (Mattinen, 2023). Risk is a complex and variable concept that differs across disciplines, involving potential outcomes that span from positive to negative and may present both opportunities and threats based on the likelihood of an event happening. According to (Schwarz, 2015), risk management is a structured approach for assessing and evaluating as uncertainties, officially recognized in academia and by certain government agencies worldwide.

2.4 AI in risk management

Thanks to AI-driven learning processes, insights that are today limited by apparent post-loss events may eventually become proactive by utilizing vast amount of previous data (Naim, 2022). Numerous important aspects greatly contribute to the benefits of risk management. Using vast amount of both structured and unstructured data, combining information and seeing changing trends improves the comprehensive and accuracy of risk assessment (Biolcheva, 2021). In addition, by automating repetitive operations and providing ongoing assistance throughout the risk management processes, efficiency is significantly increased, and costs are reduced (Somer & Thalmann, 2023). Adopting real-time and predictive capabilities also makes it possible to identify new hazards early on, with support proactive risk mitigation plans and prompt action in emergency scenarios. Finally, increased risk visibility and insights support better decision-making by providing operational terms and upper management with insightful predictive data that helps them manage risk more effectively (Naim, 2022).

Currently, Artificial Intelligence (AI) algorithms play a vital role in risk management by assessing and mitigating many forms of risk, including market volatility and credit defaults (Mesihovic A. & Nordström H., 2021). Although traditional risk management

techniques rely on past performance and pre-stablished guidelines, they are limited in their capacity to adjust to changing market conditions (Gautam A., n.d.). On the other hand, AI uses machine learning to examine real-time data iteratively and modifies its risk model in response to changing conditions and unforeseen events (Mossavar-Rahmani et al., 2023). AI's predictive analytics is essential for anticipating dangers ahead of time by examining large datasets, such as changes in market and credit defaults. This proactive strategy strengthens risk management's resilience and gives institutions the ability to successfully traverse uncertainty. Additionally, AI improves portfolio management by providing real-time insights and suggestions, and by using automated trading algorithms to optimize investment decision. By executing transactions in accordance with market trends, these algorithms improve efficiency and let institutions take advantage of opportunities quickly and strategically (Mossavar-Rahmani et al., 2023).

3 Method

The research methodology chapter is like a road map of researchers, guiding them on how to conduct their study effectively. It helps researchers understand different approaches, tools and techniques they can use to select the best method for their research. By analyzing research methodology, researchers can find effective solutions to their research problems. Research methodology involves two main types of data collection method: quantitative and qualitative. Quantitative research deals with data that can be measured and analyzed statistically, while qualitative research focuses on collecting high-quality, descriptive data. The methodology chapter is crucial for ensuring that the research is authentic and well-executed.

3.1 Choice of method

This thesis employs a descriptive research design to conduct a thorough investigation into how Artificial Intelligence (AI) is applied in risk management practices. As outlined by (Vukšić et al., 2013), descriptive research aims to systematically describe and analyze the various features or phenomenon, focusing on providing A detailed account of subject without attempting to establish a causal relationship. This approach is particularly suited to this study because it allows for an in-depth examination of AI's

integration into risk management, capturing detailed information on its implementation, impacts, and associated challenges.

Descriptive research is preferred for this thesis due to its effectiveness in collecting and presenting data that reflect current conditions and practices related to AI in risk management. This method involves comprehensive data collection techniques such as surveys, observations and analysis of existing data, which help in documenting rea-world applications and outcomes of AI technologies. The objective is to provide a well-rounded understanding of how AI tools and strategies are being utilized within organizations to manage and mitigate risks.

Choosing this research design supports the thesis's aim to deliver empirical insight into the practical ramifications of AI in risk management without the complicity of proving casualty. This method ensured that research remains focused on the practical aspects of AI application in risk management, aligning with the study's goals to enhance understanding and support decision-making in this evolving field.

3.2 Date collection method

An essential component of research is the data collecting method, which describes the methods used to obtain data for analysis. Researchers may make sure that the data they collect is relevant to their study topic and help them answer their research questions by carefully choosing the best approach. The two main types of data collection techniques used in scientific research are primary and secondary. Primary data collection is obtaining information directly from sources while preserving its validity and integrity. This methodology integrates a range of quantitative and qualitative approaches, such as surveys and interviews, to guarantee the validity and relevance of the data gathered. On the other hand, the process of gathering secondary data entails gaining access to previously collected information from publications like books, journals, and internet databases. As mentioned by (Glendon et al., 2016), even if this approach gives users access to a multitude of data, there can be questions about the data's dependability and correctness. However, because secondary data gathering makes use of already-existing information rather than requiring lengthy data collection methods, it has the advantage of being time-efficient. In general, the selection between primary and secondary data

gathering methods is contingent upon various aspects, including the nature of the study issue, the resources available, and the research objectives.

In conducting the secondary data collection for this thesis, a wide array of rigorously selected, high-quality sources are utilised to ensure comprehensive coverage and authoritative insights. The data is primarily extracted from peer-reviewed academic journals Relevant books and book chapters that focus on risk management and AI technologies offer in-depth theoretical and contextual frameworks, enhancing the foundational knowledge. Furthermore, previously conducted research papers available in digital databases like, theseus.fi, research gate, google scholar etc contribute empirical studies and findings that are crucial for building a robust literature review. Each source is carefully selected to ensure relevance to the topic and compliance with academic standards, providing a well-rounded and credible basis for the analysis. According to (J. U. Ahmed, 2010), these criteria were,

Authenticity: The materials used must be genuine, unaltered, and honest.

Representativeness: The materials must accurately reflect the subject being studied. This implies that the information obtained from the original materials should be pertinent and typical of such sources.

Meaning: The sources need to be clear and easy to understand. This is crucial for ensuring that both the researcher and the readers of the study can comprehend the information provided.

Credibility: The documents must originate from a reliable source, ensuring they are dependable and adhere to the norms of unbiased academic research.

To ensure the secondary data collected for the thesis meets the essential criteria of authenticity, representativeness, meaning, and credibility, the following meticulous process of source selection and verification was employed:

Authenticity

- Source Verification: Checked publisher credibility and publication history, used secure websites like theseus.fi, research gate and google scholar.
- Content Check: Cross-referenced document contents against other publications to verify non-manipulation and accurate representation.

Representativeness

- Scope and Relevance: Selected sources that directly addressed AI in Risk Management or closely related topics.
- Diverse Perspectives: Included sources from various geographical locations and methodologies to reflect the global and multifaceted nature of AI in risk management.

Meaning

- Language and Clarity: Choose documents in English with clear, understandable content; excluded complex or ambiguous sources.
- Explanation and Context: Reviewed supplementary materials to ensure comprehensibility of jargon and complex concepts.

Credibility

- Authoritative Sources: Selected from established publications and respected organisations; prioritised peer-reviewed academic journals and reputable market research firms.
- Academic Standards: Ensured adherence to academic standards by cross-referencing findings and using multiple reports to avoid reliance on isolated data.

This structured approach in source selection guarantees that the data is relevant, informative, reliable, and representative of the current insights into AI applications in risk management.

3.3 Research approach

To find the answers to their study questions, researchers employ a research approach. This methodology functions as a road map, directing the investigator during the phases

of data collection, analysis, and conclusion drafting. Furthermore, a careful evaluation of the research approach's efficacy is essential since it guarantees that the study is carried out in a scientific and systematic way, producing results that are more significant and trustworthy. In scientific studies, there are two main categories of research approaches: deductive and inductive, as (Zhao et al., 2013) pointed out. While deductive reasoning begins with basic principles or theories and applies them to specific circumstances to evaluate hypotheses, inductive reasoning draws general conclusions from specific observations or instances. Every strategy has benefits and things to keep in mind and the choice between them depends on the nature of the research question and the goals of the study.

The inductive approach is highly suitable for a thesis investigating the role of Artificial Intelligence (AI) in Risk Management, especially when utilising tools like SWOT analysis and secondary data collection. This approach helps better understand the complicated ways AI interacts and introduces new possibilities in this field, enabling the creation of well-founded strategies and recommendations from strong, data-based general conclusions. Choosing this method not only improves the scholarly value of the thesis but also boosts its practical usefulness by pinpointing real opportunities and risks in risk management.

3.4 Analysis of the data

In this paper, the researcher has employed Documentary Analysis. It is a detailed qualitative research technique that involves a systematic approach to gather, organize, and interpret documents to extract useful information and develop an understanding of the topic at hand (Bowen, 2009)The process begins with a meticulous selection of documents, where researchers choose relevant materials such as books, academic papers, policy documents, and media articles based on predefined criteria such as their relevance to the research questions, authenticity, and informational value. These documents are then meticulously organized in a way that facilitates efficient analysis—this could be by chronological order, theme, or source type.

Later thematic analysis is used for coding, where data is grouped under pre-determined themes which helps in identifying trends and patterns within the documentation.

(Bryman & Bell, 2011). Critical interpretation is another crucial aspect; researchers not only synthesize the factual content presented in the documents but also critically assess the academic journals, industry reports, professional surveys, and case studies related to AI applications in risk management. By reviewing and synthesising this already published data, the researcher can identify significant trends, challenges, and opportunities without the time and resource commitments required for primary data collection.(Bowen, 2009) This method allows for a comprehensive understanding of the current landscape and historical context of AI in risk management, providing a robust basis for subsequent thematic analysis. It efficiently supports the exploration of vast amounts of literature and data, facilitating the extraction of relevant themes and strategic insights that are essential for crafting informed, data-driven conclusions in the thesis.

A SWOT analysis was conducted based on the thematic findings to systematically evaluate the strengths, weaknesses, opportunities, and threats associated with AI technologies in risk management (Queensland Government, 2022). This analysis provided a structured insight into the strategic factors influencing the adoption and impact of AI in this field.

In this article we thoroughly analyze the results based on a review of a range of reliable sources as outlined in Table 1 of the Analysis section. These sources include journals, books and authoritative articles that provide valuable insights, into how Artificial Intelligence (AI) is integrated into risk management practices across various industries. By drawing from these sources the article systematically examines the ways in which AI technologies improve risk management methods tackling challenges and capitalizing on opportunities in the field. The conclusions presented stem from this data analysis ensuring that they are not pertinent but also backed by empirical evidence reflecting both the current state and future prospects of AI, in reshaping risk management approaches.

#	Document Name	Document	Author
1	**Machine Learning and AI for risk management**	***Book section***	**Saqib Aziz and Michael Dowling**
2	**Roadmap for Risk Management Integration Using AI**	**Journal**	**Petya Biolcheva1 and Evgeni Valchev2**

3	**Audience-Dependent Explanations for AI-Based Risk Management Tools: A Survey**	**Article**	**Branka Hadji Misheva, David Jaggi, Jan-Alexander Posth, Thomas Gramespacher, Joerg Osterrieder**
4	**Enhancing risk management in hospitals: leveraging artificial intelligence for improved outcomes**	**Journal**	**Ranieri Guerr**
5	**How AI is shaping the future of Risk Management and compliance**	***Article***	**FinTech Global**
6	**How Might Artificial Intelligence Applications Impact Risk Management?**	**Journal**	**John Banja, PhD**
7	**Artificial Intelligence: The Strategy of Financial Risk Management**	**Journal**	**Abhijeet Kumar, Avinash Kumar, Neha Kumari, Sneha Kumari, Puja Mishra, Ajit Behura, Neha KumariAI**
8	**Harnessing the Power of AI for Enhanced Regulatory Compliance and Risk Management in Fintech**	**Article**	**Rajath Karangara, Abhishek Shende, Satish Kathiriya**
9	**Artificial Intelligence and Bank Credit Analysis: A review**	**Article**	**Hicham Sadok, Fadi Sakka, Mohammed El Hadi El Maknouzi**
10	**Challenges of Financial Risk Management: AI Applications**	**Article**	**Vesna Bogojević Arsić**
11	**AI in Project Management: Exploring Theoritical Models for Decision-Making and Risk Management**	**Journal**	**Opeyemi Abayomi Odejide, Toluope Esther Edunjobi**
12	**Risk Management of AI in Industry: A Literature Review**	**Research Paper**	**Paul Somer and Stefan Thalmann**

Table 1. Data Sources

3.5 Validity and reliability

In studies, like this thesis that explores the use of Artificial Intelligence (AI) in risk management ensuring validity and reliability is essential to differentiate research from less rigorous investigations. Validity, as described by (Mohamad et al., 2015), concerns the suitability and accuracy of the research framework covering the selection of tools, methods and procedures used from data collection to analysis. Maintaining validity means that the research design can accurately capture and interpret the phenomena resulting in outcomes that're meaningful and representative of real-world scenarios.

(Ahmed & Ishtiaq, 2021), emphasize the importance of validity in guaranteeing that the methodologies and data collection techniques employed can generate insights effectively. This includes integrating approaches and potentially involving moderators to ensure thorough coverage and depth, in data collection enhancing the credibility and relevance of the study’s findings.

Reliability, as explained by (Ahmed & Ishtiaq, 2021), refers to how consistent the research approach's in measuring the phenomenon being studied. For this thesis results to be reliable applying the study's methodology under circumstances should produce outcomes. Consistency plays a role, in showing that the results of the study reflect trends in AI and risk management rather than just specific circumstances.

Furthermore, (Saunders et al., 2015), stress the significance of being aware of errors and risks that could impact the accuracy and reliability of research findings. They emphasize that researcher bias or differences in researcher skills can sway conclusions emphasizing the necessity for a research process that's well documented and open to verification and replication by peers.

This thesis gives importance to these aspects by utilizing an organized research methodology based on an examination of relevant literature and theoretical frameworks. Such an approach not only bolsters the study's credibility but also ensures that the findings and recommendations for the application of AI in risk management are both trustworthy and actionable.

3.6 Ethics

Ethics "are a set of moral principles" (Merriam-Webster, 2024), and in academic research, it refers to the principles of integrity, respect, and responsibility that govern the conduct of investigative processes to ensure fairness, transparency, and safety for all participants involved. For this thesis, adhering to ethical norms is crucial not only to validate the research outcomes but also to uphold the moral standards expected in scholarly activities.

To uphold norms rigorously this thesis relies on trustworthy secondary data sources that undergo thorough authentication checks to prevent any inclusion of manipulated data. This meticulous approach ensures the reliability and accuracy of the research findings. Moreover, proper citations and attributions are consistently employed throughout the thesis to honour intellectual property rights and avoid any instances of plagiarism.

Additionally, this thesis transparently outlines its research methodology and process for reproducibility and verification by researchers in line with principles of openness. It

delves into considerations surrounding AIs implications in risk management addressing concerns such as privacy breaches and algorithmic bias. By examining these issues and proposing mitigating measures, against harm this thesis upholds a high standard of social responsibility and ethical scholarship.

4 Result

In the results section of this thesis, author delve into the comprehensive findings derived from our thematic analysis and SWOT analysis of the factors influencing AI-implemented risk management. The data for this analysis was meticulously collected and synthesized from a range of authoritative sources, as detailed in Table 1 of the Analysis of Data section. This table lists key documents and publications that have contributed to the robust foundation of this research, ensuring that our insights are well-supported and credible.

Through thematic analysis, author systematically organized and interpreted the vast amount of data to uncover underlying patterns and themes related to AI's application in risk management. This method not only helped identify the trends but also brought out the subtle nuances that define the present status and future prospects of AI in this field. After conducting this analysis, a SWOT framework was employed to classify these observations into strengths, weaknesses, opportunities and threats offering a perspective on how AI technologies impact risk management practices. By combining Thematic analysis with SWOT analysis, a lucid understanding of the factors influencing AI driven risk management strategies across different sectors has been achieved. The insights presented in this section are essential, for grasping how AI enriches, challenges and revolutionizes risk management procedures through examination supported by a wealth of literature cited in the research references.

This section uses tables to offer a quick overview and summarize detailed texts, helping readers understand comparative analysis and connect different sections of the thesis for better thematic coherence. Data in Tables 2 and 3 are sourced from Table 1, facilitating an easier and more cohesive reading experience.

4.1 Theme.1: Risk management across various risk domains

Table 2: Comparative overview of Traditional vs. AI-Implemented Risk-Management

Risk Type	Traditional Risk Management	AI-Implemented Risk Management
Credit Risk	Relies on historical financial data and simple models like linear regression, often failing to adapt to new financial behaviours or recognize non-traditional creditworthiness indicators.	Integrates diverse data types using complex algorithms, enhancing accuracy and timeliness in predicting creditworthiness.
Market Risk	Uses tools like Value-at-Risk based on historical data, struggling to forecast during unpredictable market events, potentially missing emerging trends.	Employs predictive analytics on large data sets, including real-time trading information, to proactively manage risks and simulate various market scenarios.
Operational Risk	Depends on manual processes and historical data analysis, which can delay responses to emerging challenges and increase potential for disruptions.	Enhances management by continuously monitoring and analysing data to predict failures and detect anomalies, allowing for proactive interventions.
Regularity Compliance	Generally reactive, relying on substantial human effort, inefficient and error-prone, potentially leading to compliance failures and penalties due to slow adaptation to new regulations.	Automates monitoring and updates compliance strategies in real-time, reducing resource requirements and lowering the risk of penalties for non-compliance.

4.1.1 Credit risk management

Traditional methods like linear, logit, and probit regressions primarily rely on historical data to manage credit risk and may not adapt well to new market dynamics (Aziz & Dowling, 2019). In contrast, AI and machine learning offer enhanced capabilities by

processing vast, diverse datasets, improving accuracy in credit default predictions and borrower reliability assessments through techniques such as deep learning and decision trees.

According to a study, by (Aziz & Dowling, 2019), banks and other financial institutions are increasingly using machine learning techniques such as decision trees to categorize borrowers based on their risk levels. This method enables them to make distinctions between different levels of credit risk by considering various unconventional data points, including online shopping habits and social media interactions. In another example (Odejide & Edunjobi, 2024) demonstrate how deep learning is employed to predict changes in a borrowers situation by analyzing real time economic indicators and personal transaction details.This evolution in methodology supports more dynamic and precise risk evaluations, substantially reducing potential losses by facilitating informed decision-making promptly (Aziz & Dowling, 2019); (Odejide & Edunjobi, 2024).

4.1.2 Market risk management

Traditional market risk tools such as Value-at-Risk are often restricted by their reliance on historical market behaviours and may fail to predict atypical market events accurately (Bogojevic Arsic, 2021). AI technologies, including advanced machine learning like clustering and neural networks, allow for real-time analysis and adaptability, enabling financial institutions to handle market volatilities better by simulating various scenarios and conducting robust model stress testing (Bogojevic Arsic, 2021); (Odejide & Edunjobi, 2024). For example, as (Bogojevic Arsic, 2021) mentions, financial institutions now use AI to analyze patterns in high-frequency trading data, which traditional models struggle with. Furthermore, (Odejide & Edunjobi, 2024) discuss how AI systems use networks to model economic situations and forecast their effects on market stability helping organizations creat stronget financial plans. Thus, AI's dynamic understanding of market changes significantly improves risk mitigation strategies, providing substantial benefits in model validation and risk prediction (Aziz & Dowling, 2019); (Odejide & Edunjobi, 2024).

4.1.3 Operational risk management

Operational risk management in traditional settings is generally manual and reactive, potentially leading to delays when addressing operational failures or anomalies (Aziz & Dowling, 2019). AI transforms this area by automating the monitoring and analysis of operational data, which helps predict and mitigate risks proactively. Machine learning is instrumental in identifying patterns that may lead to operational disruptions, thus enhancing the overall security and resilience of organizational operations (Aziz & Dowling, 2019); (Odejide & Edunjobi, 2024). For example (Aziz & Dowling, 2019) explain how AI technology, in factories keeps an eye on production lines to catch equipment issues like unusual vibrations or temperature changes, which then trigger maintenance interventions before problems escalate. Likewise (Odejide & Edunjobi, 2024) showcase how AI is used in the logistics sector to analyze real time vehicle data and traffic information, for better route planning and minimizing delays ultimately boosting efficiency and safety.

4.1.4 Regularity compliance

Regulatory compliance traditionally involves considerable manual effort, making the process inefficient and prone to errors. AI-driven Regulatory Compliance solutions revolutionize this domain by enabling continuous, automated monitoring and real-time adaptation to regulatory changes (Aziz & Dowling, 2019). For instance, (Aziz & Dowling, 2019) explain the utilization of AI systems, in institutions to adjust compliance procedures following the introduction of new financial regulations. These systems analyze datasets to verify that all transactions adhere to existing laws thereby decreasing the burden, on compliance officers and minimizing the chances of mistakes. Moreover (Odejide & Edunjobi, 2024) offer perspectives on how AI driven tools enhance compliance processes by forecasting potential compliance challenges. This technology reduces compliance costs, minimizes the risk of penalties, and improves the accuracy of compliance processes, making regulatory adherence faster and more reliable (Aziz & Dowling, 2019);(Odejide & Edunjobi, 2024).

AI and machine learning are redefining risk management across various domains by providing enhanced efficiency, accuracy, and adaptability compared to traditional methods (Aziz & Dowling, 2019); (Bogojevic Arsic, 2021a). The integration of AI into

risk management not only boosts operational effectiveness but also equips institutions with the tools necessary to navigate modern financial challenges with greater confidence and competence. This paradigm shifts in risk management underscores AI's potential to transform financial operations profoundly and sustainably (Aziz & Dowling, 2019; Bogojevic Arsic, 2021; Odejide & Edunjobi, 2024).

4.2 Theme 2: Factors of risk management

The integration of Artificial Intelligence (AI), in risk management is changing the way risks are recognized, mitigated and shifting away from techniques to data focused strategies.

Table 3: Comparative overview of Tradetional vs. AI-Based Risk Management Aspects

Aspect	**Traditional Risk Management**	**AI-Based Risk Management**
Predictive Accuracy	Relies on static, historical data using linear models which may not capture complex dynamics of modern financial markets.	Enhances accuracy with machine learning algorithms analysing vast datasets, adapting to new information in real-time.
Decision Making	Decisions are made based on structured processes and significant human intervention.	Automates decisions, providing continuous, real-time assessments, reducing human bias.
Scalability and Adaptability	Lacks flexibility to quickly adapt to new data or changes, limiting effectiveness in dynamic conditions.	Offers scalable and adaptable solutions that learn and adjust continuously to new information.
Cost Effectiveness	Resource-heavy, involving substantial human intervention and associated costs.	Reduces labour costs by automating tasks, enhancing operational efficiencies.
Proactive Risk Identification	Typically reactive, focusing on managing risks after identification.	Utilizes predictive capabilities to identify risks before they manifest, enabling pre-emptive actions.
Customization	Uses standardized approaches	Provides customizable solutions

and Flexibility	with limited adaptability to specific organizational needs.	tailored to specific business processes.
Transparency and Explainability	More transparent due to simpler models that are easier to understand and explain.	Complex models can create "black box" scenarios that challenge transparency and explainability.

Predetictive accuracy

The shift from traditional to AI-based risk management signifies a profound transformation in how risks are predicted and managed across various industries. AI's ability to process and analyse large datasets in real-time provides a more accurate and timely understanding of potential risks, enabling more effective and proactive management practices. In healthcare, AI applications like deep learning are utilized to predict patient outcomes more accurately by continuously analysing data streams, which traditional methods cannot achieve efficiently (Guerra, 2024).

Decision making

Similarly, AI models, as demonstrated by Zest Finance, process extensive non-traditional data points quickly to make lending decisions in markets, where many consumers lack established credit histories (Aziz & Dowling, 2019). This rapid data processing capability significantly reduces decision-making time, improving efficiency over traditional models that rely on historical data and manual reviews (Sadok et al., 2022), (Aziz & Dowling, 2019).

Scalability and adaptability

Traditional risk management systems often face limitations in quickly adapting to new market conditions or integrating various types of data. This lack of flexibility can hinder responsiveness in rapidly changing environments such as financial markets, where risks evolve swiftly. An example, traditional systems struggling to adjust to the fast-paced changes in stock market algorithms and risk factors associated with high-frequency trading (Kumar et al., 2024). In contrast, AI systems are inherently designed for scalability and adaptability, enabling them to continuously learn from incoming data.

This dynamic learning capability allows AI to adjust its models in real-time to suit changing conditions, as illustrated by AI applications that dynamically recalibrate risk models based on live market data (Biolcheva & Valchev, 2022), (Fintech Global, 2023).

Cost effectiveness

Traditional risk management often requires substantial manpower for tasks such as data collection, processing, and analysis, which can be expensive and inefficient. An example from the financial sector shows manual monitoring systems involving numerous compliance officers checking transaction compliance, leading to high labour costs (Kumar et al., 2024). AI significantly reduces these costs by automating routine and repetitive tasks, which not only cuts down on labour expenses but also boosts process efficiency. For instance, AI applications in compliance monitoring can automatically process large datasets to flag anomalies, thereby reducing the need for manual checks and lowering operational costs (Fintech Global, 2023).

Procative risk identification

Traditional risk management methods are typically reactive, dealing with risks only after they have emerged, which can be problematic in sectors where rapid responses are crucial. An example includes traditional credit risk systems that adjust their strategies only after defaults have occurred, which can be too late to prevent significant losses (Kumar et al., 2024). Conversely, AI's proactive capabilities enable the prediction of potential risks before they occur. Using predictive analytics, AI can forecast potential loan defaults by analysing current financial behaviours and economic trends, allowing institutions to take pre-emptive measures such as adjusting credit limits or offering early interventions (Biolcheva & Valchev, 2022), (Fintech Global, 2023).

Customization and flexibility

Traditional methods in risk management often use standardized models that might not fit the specific needs of all organizations or might not easily adapt to industry changes. For example, traditional risk assessment tools in insurance may not account for unique client profiles or emerging risk factors like cyber threats (Kumar et al., 2024). AI, however, offers highly customizable solutions tailored to specific business processes or industry requirements. AI-driven risk management systems can be programmed to consider unique variables specific to each organization, such as bespoke risk factors in

the insurance industry, making the risk assessment more relevant and effective (Biolcheva & Valchev, 2022).

Transparency and explainability

Traditional models, due to their simpler nature, are generally more transparent and easier to understand, which is beneficial for regulatory compliance and stakeholder communication. For instance, linear regression models used in evaluating loan applications are straightforward and easy to explain to regulators (Hadji Misheva et al., 2021) , (Kumar et al., 2024). AI models, however, often lack this transparency because they may use complex algorithms whose decision-making processes are not easily discernible. This opacity, known as the "black box" issue, poses challenges in sectors where understanding the basis of decisions is critical, such as in healthcare or financial services, where explaining the basis of a loan denial or medical diagnosis is necessary for compliance and trust (Hadji Misheva et al., 2021).

4.3 Theme 3: Challenges in AI integration

Artificial intelligence (AI) into risk management frameworks offers opportunities, for transformation but it also comes with various challenges, in technical, ethical and organizational aspects. Addressing these challenges requires customized solutions to ensure that AI improves risk management practices without adding complications or risks. It is crucial to tackle these challenges with measures to guarantee that AI enhances risk management procedures efficiently without creating new risk.

Data Privacy and Security

The security and confidentiality of data processed by AI systems are paramount, necessitating robust measures to prevent unauthorized access and breaches. Effective data protection is critical in maintaining the integrity of sensitive information and ensuring compliance with legal and ethical standards. Papers emphasize the importance of implementing state-of-the-art cybersecurity measures, such as encryption and secure data storage practices, to safeguard data against potential threats (Karangara Rajath et al., 2024); (Bogojevic Arsic, 2021a); (Soravito, 2023);(Banja, 2020).

Accuracy and Reliability of AI Algorithms

AI systems must be highly accurate and reliable to avoid critical errors, such as false positives or negatives in applications like fraud detection. This challenge necessitates rigorous validation and continuous monitoring of AI algorithms to ensure they function correctly across different scenarios and maintain consistency over time. Regular updates and adjustments are also required to adapt to new data and changing conditions (Karangara Rajath et al., 2024); Somer & Thalmann, 2023; Soravito, 2023).

Ethical Implications and Bias Mitigation

Several papers address the ethical concerns associated with AI, particularly the risk of perpetuating existing biases through AI algorithms. Ensuring fairness and avoiding discriminatory outcomes is crucial, necessitating the design and implementation of AI systems that are both ethical and unbiased (Karangara Rajath et al., 2024), (Soravito, 2023).

Interpretability and Transparency

The inherently complex and opaque nature of some AI models, especially those based on deep learning, raises challenges in interpretability and transparency. Stakeholders need to understand how decisions are made by AI systems to trust and effectively integrate these technologies into their operations. Explaining AI decisions through transparent methodologies is crucial, particularly in regulated sectors like finance, to ensure compliance and foster accountability (Karangara Rajath et al., 2024); (Bogojevic Arsic, 2021).

Resource Limitations and Infrastructure Needs

The deployment of AI technologies requires significant resources, including skilled personnel to develop, manage, and monitor AI systems, and advanced technological infrastructure to support their operations. Resource constraints can limit the ability to implement and scale AI solutions effectively, highlighting the need for substantial investment in both human capital and technological capabilities (Bogojevic Arsic, 2021a); (Soravito, 2023).

Human-Machine Collaboration

Striking a balance between AI automation and human oversight is vital to ensure that AI complements rather than replaces human judgment. AI should aid in enhancing decision -making processes without undermining the role of human expertise, especially in complex or sensitive contexts. Maintaining this collaboration is key to leveraging the strengths of both AI and human insights to achieve optimal outcomes in risk management (Somer & Thalmann, 2023).

Technical Tools and Standards for Regulatory Compliance

The integration of AI in industrial applications necessitates the use of technical tools aligned with consensus-driven standards. As AI technology advances rapidly, regulatory frameworks must be adaptable and evolve accordingly to effectively manage the associated risks. This ensures that AI deployments comply with industry standards and regulatory requirements, maintaining system integrity and public trust (Somer & Thalmann, 2023).

Data Management

In sectors like commercial banking, where data may be extensive and unstructured, effective data management becomes crucial. Organizing and making data accessible is essential for AI systems to perform efficiently. This enables the AI to analyse data effectively and generate insightful outputs, providing a robust foundation for AI operations and decision-making processes (Bogojevic Arsic, 2021).

Model Risk Management

As markets evolve, AI models need to be regularly updated to remain relevant and accurate. Continuous model validation is critical to ensure these models adapt to market changes and maintain their predictive accuracy. This process helps prevent financial losses that could result from relying on outdated or incorrect models, thus safeguarding the financial stability of institutions using these AI system (Bogojevic Arsic, 2021).

4.4 SWOT analysis of AI-implemented risk management factors

SWOT Analysis is a tool used for strategic planning and strategic management in organizations. It can be used effectively to build organizational strategy and competitive strategy (GÜREL, 2017). The evaluation process inherent in SWOT analysis delves into the Strengths, Weaknesses, Opportunities and Threats associated with a project or business venture. By examining strengths and weaknesses along with opportunities and threats from the environment stakeholders can make well informed decisions and devise effective strategies. This approach lays a foundation for comprehending both the detrimental factors influencing the successful integration and functioning of AI technologies, in risk management.

The factors identified in the discussion of AI integration into risk management align with specific elements of a SWOT analysis due to their inherent characteristics and impacts on organizational strategy and operations. These paragraphs integrate insights from referenced papers to highlight the complex interdependencies and implications of AI in risk management, emphasizing the need for careful consideration and management of these factors to leverage AI effectively.

Table 4: Classification of AI-Implemented factors in SWOT

Strength	**Weakness**
a. Predictive Accuracy b. Proactive Risk Identification c. Cost Effectiveness d. Customization and Flexibility	a. Transparency and Explainability b. Resource Limitations and Infrastructure Needs
Opportunities	**Threats**
a. Scalability and Adaptability b. Data Privacy and Security c. Human-Machine Collaboration d. Technical Tools and Standards for Regulatory Compliance	a. Decision Making b. Ethical Implications and Bias Mitigation c. Model Risk Management d. Data Management

4.4.1 Strength

Predictive accuracy, proactive risk identification, cost effectiveness and customization and flexibility are recognized as key strengths of AI in risk management. Predictive accuracy significantly enhances the capability to forecast future conditions or occurrences, which is crucial for proactive measures in risk management (Karangara Rajath et al., 2024); (Biolcheva & Valchev, 2022), (Fintech Global, 2023). This accuracy is essential in sectors like finance where timely and accurate predictions can prevent large-scale losses. Proactive risk identification leverages AI's ability to analyse patterns and predict potential threats before they materialize, allowing organizations to implement preventive strategies effectively (Biolcheva & Valchev, 2022), (Fintech Global, 2023). AI's ability to automate routine tasks reduces Labor costs and enhances operational efficiencies. Customization and flexibility are vital as they enable AI systems to be tailored specifically to the requirements of the organization, thereby increasing the effectiveness and relevance of the risk management process (Biolcheva & Valchev, 2022).

4.4.2 Weakness

Transparency and explainability, along with resource limitations and infrastructure needs, are significant weaknesses. The transparency and explainability of AI systems are often limited due to the complexity of the models used, particularly in deep learning. This lack of clarity can be a substantial barrier in regulated industries where understanding AI decisions is crucial for compliance (Karangara Rajath et al., 2024). Resource limitations and infrastructure needs represent a significant challenge, as the implementation and maintenance of AI systems require substantial financial and technological investments, which can be prohibitive for some organizations (Bogojevic Arsic, 2021).

4.4.3 Opportunities

Scalability and adaptability, enhancements in data privacy and security, and the potential for effective human-machine collaboration are promising opportunities. Scalability and adaptability of AI systems allow for continuous learning and adjustment to new data or changing environments, offering organizations the agility to respond swiftly to market or environmental changes (Biolcheva & Valchev, 2022), (Fintech

Global, 2023)**.** Data privacy and security are increasingly critical, and improvements in these areas via AI can help organizations protect sensitive information and comply with stringent data protection regulations (Karangara Rajath et al., 2024); (Bogojevic Arsic, 2021b)**.** Human-machine collaboration emphasizes the synergy between AI and human judgment, enhancing decision-making processes and operational efficiency (Somer & Thalmann, 2023).

4.4.4 Threats

Decision making processes influenced by AI, ethical implications and bias mitigation, and the challenges of model and data management are major threats. In decision making**,** reliance on AI can introduce biases if not carefully managed, which can lead to poor decisions and potential legal or reputational repercussions (Hadji Misheva et al., 2021b). The ethical implications and bias mitigation in AI systems require constant vigilance to ensure fair and unbiased outcomes, which is especially pertinent in sectors like healthcare and law enforcement (Karangara Rajath et al., 2024). Model risk management and data management need rigorous oversight to ensure the accuracy and relevance of AI models, as failures in these areas can lead to significant operational disruptions and financial losses (Bogojevic Arsic, 2021).

In summary incorporating Artificial Intelligence into risk management brings about a change that enhances efficiency, accuracy, and flexibility of traditional methods, as shown through predictive accuracy, proactive risk identification, and cost effectiveness. Nevertheless, integrating AI also comes with challenges like the need for enhanced transparency, significant infrastructure investment, and the management of ethical concerns. By leveraging its strengths and addressing its weaknesses proactively AI can establish a foundation, for modern and adaptable risk management strategies that meet current needs and future challenges. To unlock its potential, a balanced strategy combining advancements with thorough supervision is crucial to ensure that AI driven risk management not only serves organizational objectives but also upholds ethical values and regulatory standards.

5 Discussion

This chapter critically examines the findings from the comprehensive analysis of Artificial Intelligence's (AI) impact on risk management practices. This thesis aims to clarify how AI enhances the efficiency and efficacy of risk management by analysing how empirical findings match up with theoretical framework in this section. This showcases how AI has the power to revolutionize risk management situations.

5.1 Enhancement brought by AI in risk management

In exploration of Artificial Intelligence (AI) in risk management, this thesis effectively bridges the gap between theoretical expectation and empirical findings. Theory posits that AI can significantly improve risk management by leveraging its capabilities. These theoretical aspects are explored in depth, suggesting that AI can transform traditional risk management practices that are typically slow, reactive and reliant on historical data.

The empirical findings of this thesis provide robust evidence supporting these theoretical claims. For example, in credit risk management, AI methods go beyond traditional boundaries by integrating various data types and utilizing advanced analytics. The thesis discusses in detail how AI systems outperform traditional methods by delivering faster and more accurate assessment of creditworthiness. This not only validates the theoretical assertions about AI’s advanced analytical capabilities but also illustrates how it translate into real-world efficiency and effectiveness.

Additionally, the findings highlight AI’s transformative impact on market risk management. AI powered systems have demonstrated a shift away from the strategies commonly seen in methods. Through continuous analysis of market data, AI enables organizations to anticipate and mitigate potential volatilities proactively. This proactive approach is strongly aligned with the theoretical discussion of AI functionalities, which suggests that AI’s ability to process vast amounts of information in real time significantly enhances decision-making processes.

In operational risk management, AI’s continuous monitoring and data analysis capabilities allow for the preemptive identification and mitigation of potential disruptions, significantly enhancing operational efficiency and resilience. For instance,

unusual vibrations or temperature changes. This practical application is a direct manifestation of the theoretical benefits discussed, underscoring AI's role in improving the speed and accuracy of decision-making processes in real-time scenarios.

Finally, the automation of compliance processes through AI greatly reduces the chance of non-compliance when compared to the traditional methods that depend on manual oversight and delayed revision. AI maintains compliance processes, up to date with regulation without needing much human interventions. An automated system is very crucial, especially in industries where rules often changes and the risk of not following them is very high. This ability directly reflects the theoretical framework of AI in enhancing efficiency and reducing human error.

5.2 Traditional vs. AI-implemented risk management

In this thesis, there is compelling demonstration of how Artificial Intellengence (AI) redefines risk management practices, substantiating theoritical predictions with robust emperial findings. The theoritical framework posited that tradetional risk management, often rely on historical data and static models that tends to be reactive particularly in dynamic environments where risks evolve frequently. In contrast the theory suggests that it can transform this landscape through its advanced capabilities in predictive analysis, real time data processing and strategic adaptability, enabling a shift from reactive to proactive risk management. For instance, the empirical evidence highlighted AI’s capability to detect early signs of credit fault, enabling preemptive action to mitigate risk, thus aligning perfectly with the theoretical assertation about AI predictive abilities.

Furthermore, AI’s capacity to process vast volumes of data rapidly and its ability to provide real-time insights are underscored as fundamental enhancements over conventional systems, which often fail to adapt quickly to changing environments. This adaptability of AI not only enhances the prediction of risk assessments but also improves strategic decision-making within an organization. The theoretical advantages of AI are also shown to extend beyond simple automation, with AI system enhancing organizational resilience and adaptability through their sophisticated data-driven insights.

Lastly, the empirical evidence within this thesis emphasis AI's role in strategic adaptability and decision-making flexibility, illustrating that AI integration aligns closely with organizational goals and broadens the scope of risk management. AI's role in transforming risk management practices is affirmed through its demonstrated ability to analyze and respond to risk scenarios in a proactive and efficient manner, supporting the theoretical claims of its potential revolutionize the field. This synthesis of theory and empirical findings reveals a profound impact of AI technologies, confirming their value in revolutionizing traditional risk management practices.

5.3 Challenges in AI integration

In the thesis discussion, about integrating Artificial Intelligence (AI) into risk management the real world results align closely with the theoritical framework. The theory addresses challenges, including the opacity of AI decision making processes (referred to as the "black box" phenomenon) concerns about data privacy and security and the risk of biases inherent, in AI algorithms. These theoretical issues are substantiated by data presented throughout the thesis highlighting the intricacies and risks involved in integrating AI into risk management practices.

The thesis discusses how AI presents opportunities, for risk management but also faces obstacles. One major concern is the lack of transparency in AI systems, which can undermine stakeholder trust and complicate efforts to comply with regulations. To overcome this challenge advancements in AI are crucial to help users better understand AI decision making processes.

Furthermore the importance of data privacy and security cannot be overstated, especially since AI systems often require access to datasets containing information. The theoritical framework suggest, establishing data governance measures is vital to minimize risks and prevent AI systems from becoming liabilities.

Moreover the issue of bias in AI decision making is a significient concern highlighted in both theorical framework and emperical findings. If not properly addressed, in training data could result in unfair outcomes perpetuating inequalities and creating dilemmas.

5.4 Discussion of method

Upon reflecting on the methodology used, utilizing existing data provided an overview of the landscape of Artificial Intelligence (AI) in risk management. This method allowed for an analysis of the literature establishing a strong theoretical foundation. However it did face limitations, such, as the inclusion of outdated information and the lack of firsthand empirical insights. To address these challenges and enhance the knowledge base future research could consider employing a mixed methods approach. This would entail gathering data through surveys or interviews with industry professionals offering perspectives and a deeper understanding of the practical issues and opportunities related to AI in risk management. Such an approach would not only update the underpinnings of the field but also enhance the real world applications of AI technologies, in risk mitigation.

5.5 Summary

This thesis offers an insightful examination of how Artificial Intelligence (AI) can be integrated into risk management. It showcases AI’s potential to revolutionize analytics, real-time data processing and strategic adaptability. By presenting a rounded analysis that combines empirical evidence, with theoretical frameworks the dissertation proves the effectiveness of AI compared to traditional risk management methods, especially in dynamic environments where traditional approaches fall short. Furthermore, it tackles issues such as the lack of transparency in AI decision making concerns about data privacy and inherent biases by suggesting solutions like improving AI enforcing strict data governance practices and implementing unbiased training protocols. Regarding the research methodology the dissertation acknowledges its limitations. Recommends using a mixed methods approach in studies to deepen empirical findings and ensure that AI is practically applicable in risk management. This sets the stage, for efficient risk management strategies empowered by AI technologies.

6 Conclusion

This thesis has critically explored the transformative role of Artificial Intelligence (AI) in risk management, addressing the central research questions regarding AI's enhancements over traditional methods, and the inherent challenges and opportunities. It

conclusively shows that AI considerably augments risk management capabilities through superior predictive accuracy, operational efficiency, and strategic adaptability. AI's data processing prowess allows for a more nuanced analysis, yielding accurate predictions and proactive management strategies that are especially beneficial in sectors like finance and healthcare where quick and reliable risk assessment is crucial. AI's integration into operational and compliance processes significantly reduces human Labor, minimizes errors, and expedites decision-making, thereby enhancing organizational resilience and efficiency.

Furthermore, the research illuminated how AI technologies offer customized and scalable solutions, crucial for adapting to the dynamic and complex risk landscapes of modern industries. These advancements highlight AI's capacity to not only react to existing risks but to anticipate potential future challenges, thereby transforming traditional reactive risk management into a more pre-emptive strategic approach. However, the study also acknowledges significant challenges with AI implementations, particularly concerning transparency, ethical implications, and the need for continuous human oversight to mitigate biases and interpret complex AI decisions.

Artificial intelligence (AI) plays a vital role, in enhancing risk management practices across industries. By utilizing analytics AI improves the accuracy of risk forecasts streamlines tasks for better operational efficiency and enables strategic approaches to proactively address potential risks. This innovative method represents a shift from risk management techniques that rely heavily on past data and manual procedures. Unlike methods that're slow to adapt AI powered systems can analyse complex datasets in real time leading to quicker and more well-informed decisions. However, the incorporation of AI, in risk management also brings forth challenges. One primary issue is the nature of AI systems, which can obscure decision making processes and complicate efforts to ensure transparency and accountability. Moreover, ethical concerns arise regarding data usage in how AI systems may perpetuate biases that could influence decision making processes negatively. These obstacles highlight the importance of oversight and thoughtful integration of AI technologies to maximize their advantages while minimizing risks.

6.1 Limitations of the study

The study limitations mainly stem from its use of data. While this approach allows for an overview of AI, in risk management it also comes with restrictions. One issue is that secondary data may not always capture the up-to-date developments or nuances in the changing AI landscape. Due, to the pace of advancements this data could be outdated, potentially resulting in analyses that do not reflect the latest trends or emerging challenges. Moreover, relying on sources might not offer a view of all relevant factors since they are influenced by previous research availability and focus which could overlook specific industry details or emerging risks.

Another drawback involves the chance of prejudice, in the sources that have been made public. The information obtained second-hand is prone, to being influenced by the biases of the researchers or the situations under which the data was gathered. This may impact the impartiality of the conclusions if the data utilized in the research fails to offer a representation or excessively highlights sectors or locations.

Moreover, this study's approach largely excludes firsthand empirical insights, which could offer deeper, qualitative understandings of how AI is implemented and perceived in risk management practices on the ground. Without primary data, such as interviews or case studies from professionals in the field, the study might miss out on valuable insights into the practical challenges, user acceptance, and operational intricacies of AI in risk management.

Addressing these limitations in future research could involve incorporating primary research methods, such as surveys and interviews with risk management professionals, to gain current and practical insights. Additionally, expanding the theoretical framework to include a wider array of risk management contexts and more diverse AI applications could enhance the robustness and applicability of the study’s outcomes.

6.2 Suggestions for further studies

Expanding upon the findings of this thesis, further studies should consider a couple of key areas to deepen the understanding of AI in risk management. To build upon the discoveries presented in this thesis future research should explore a couple of areas to

enhance the comprehension of AI, in risk management. Firstly integrating investigation methods like surveys and interviews with experts in risk management would provide insights into the practical hurdles and effectiveness of AI technologies directly from those actively involved. This method would not confirm the conclusions drawn from data but also offer a nuanced perspective on how AI is influencing various industries. Secondly conducting studies across sectors such as healthcare, finance and manufacturing would clarify the sector specific applications and obstacles of AI in risk management. This exploration could lead to customized approaches and potential innovations tailored to industries, in utilizing AI technology.

In addition, given the varying technology usage it would be valuable to investigate how regional variations impact the incorporation and success of AI, in risk management. Research could delve into the differences between more advanced areas examining how economic, cultural and regulatory factors influence the adoption and outcomes of AI tools. Such an inquiry could provide insights into variations in AI application. Steer tailored approaches, for utilizing AI in risk management within diverse regional settings.

References

Ahmed, I., & Ishtiaq, S. (2021). Reliability and validity: Importance in Medical Research. *Journal of the Pakistan Medical Association*, *71*(10), 2401–2406. https://doi.org/10.47391/JPMA.06-861

Ahmed, J. U. (2010). *Documentary Research Method: New Dimensions*. https://www.researchgate.net/publication/227441751_Documentary_Research_Method_New_Dimensions

Albarracín Vanoy, R. J. (2023). Logistics 4.0: Exploring Artificial Intelligence Trends in Efficient Supply Chain Management. *Data and Metadata*, *2*. https://doi.org/10.56294/dm2023145

Aziz, S., & Dowling, M. (2019). Machine Learning and AI for Risk Management. *Disrupting Finance*, 33–50. https://doi.org/10.1007/978-3-030-02330-0_3/TABLES/1

Banja, J. (2020). How Might Artificial Intelligence Applications Impact Risk Management? | Journal of Ethics | American Medical Association. *AMA Journal of Ethics*. https://journalofethics.ama-assn.org/article/how-might-artificial-intelligence-applications-impact-risk-management/2020-11

Biolcheva, P. (2021). The place of artificial intelligence in the risk management process. *SHS Web of Conferences*, *120*. https://doi.org/10.1051/shsconf/202112002013

Biolcheva, P., & Valchev, E. (2022). Roadmap for Risk Management Integration Using AI. *Journal of Risk & Control*. https://doi.org/10.47260/jrc/912

Bogojevic Arsic, V. (2021). Challenges of Financial Risk Management: AI Applications. *Management:Journal of Sustainable Business and Management Solutions in Emerging Economies*, *26*(3), 27–34. https://doi.org/10.7595/MANAGEMENT.FON.2021.0015

Bowen, G. A. (2009). Document Analysis as a Qualitative Research Method. *Qualitative Research Journal Document Analysis as a Qualitative Research Method*, *9*, 27–40. https://doi.org/10.3316/QRJ0902027

Bryman Alan, & Bell Emma. (2011). *Business research methods* (3rd ed.). Oxford University Press.

Fintech Global. (2023). *How AI Is shaping the future of risk management and compliance - FinTech Global*. FinTech Global . https://fintech.global/2023/11/06/how-ai-is-shaping-the-future-of-risk-management-and-compliance/

Gautam A. (n.d.). *The Evaluating the Impact of Artificial Intelligence on Risk Management and Fraud Detection in the Banking Sector* [Pokhara University]. Retrieved April 24, 2024, from https://scicadence.com/index.php/AI-IoT-REVIEW/article/view/25/25

Glendon, I., Clarke, S., & McKenna, E. (2016). *Human Safety and Risk Management*. https://books.google.fi/books?id=u9O1bblQHFEC&pg=PA15&source=gbs_toc_r&cad=2#v=onepage&q&f=false

Guerra, R. (2024). Enhancing risk management in hospitals: leveraging artificial intelligence for improved outcomes. *Italian Journal of Medicine*, *18*(2). https://doi.org/10.4081/itjm.2024.1721

GÜREL, E. (2017). SWOT ANALYSIS: A THEORETICAL REVIEW. *Journal of International Social Research*, *10*(51), 994–1006. https://doi.org/10.17719/JISR.2017.1832

Hadji Misheva, B., Jaggi, D., Posth, J. A., Gramespacher, T., & Osterrieder, J. (2021a). Audience-Dependent Explanations for AI-Based Risk Management Tools: A Survey. *Frontiers in Artificial Intelligence*, *4*. https://doi.org/10.3389/frai.2021.794996

Hadji Misheva, B., Jaggi, D., Posth, J. A., Gramespacher, T., & Osterrieder, J. (2021b). Audience-Dependent Explanations for AI-Based Risk Management Tools: A Survey. *Frontiers in Artificial Intelligence*, *4*, 794996. https://doi.org/10.3389/FRAI.2021.794996/BIBTEX

Haleem, A., Javaid, M., Asim Qadri, M., Pratap Singh, R., & Suman, R. (2022). Artificial intelligence (AI) applications for marketing: A literature-based study. In *International Journal of Intelligent Networks* (Vol. 3). https://doi.org/10.1016/j.ijin.2022.08.005

Harry, A. (2023). Role of AI in Education. *Interdiciplinary Journal and Hummanity (INJURITY)*, *2*(3). https://doi.org/10.58631/injurity.v2i3.52

Hester, A. (2023). *180+ Intriguing Automation Statistics - Nividous Intelligent Automation Company*. https://nividous.com/blogs/automation-statistics

Karangara Rajath, Shende Abishek, & Kathiriya Satish. (2024). Harnessing the Power of AI for Enhanced Regulatory Compliance and Risk Management in Fintech. *International Journal of Computing and Engineering* .

Kumar, A., Kumar, A., Kumari, N., Kumari, S., Mishra, P., Behura, A., & Kumari, N. (2024). *Artificial Intelligence: The Strategy of Financial Risk Management*. https://www.researchgate.net/publication/374590716_Artificial_Intelligence_The_Strategy_of_Financial_Risk_Management

Kunwar, M. (2019). *ARTIFICIAL INTELLIGENCE IN FINANCE Understanding how automation and machine learning is transforming the financial industry Thesis CENTRIA UNIVERSITY OF APPLIED SCIENCES Business Management*.

Mattinen, P. (2023). *Utilizing Risk Management in Small and Medium-sized Enterprises*.

Merriam-Webster. (2024, April). *Merriam-Webster. Definition of ethics.* Merriam-Webster: America's Most Trusted Dictionary.

Mesihovic A., & Nordström H. (2021). *Artificial Intelligence and Machine Learning usage in credit risk management*. University of Gothenburg.

Mohamad, M. M., Sulaiman, N. L., Sern, L. C., & Salleh, K. M. (2015). Measuring the Validity and Reliability of Research Instruments. *Procedia - Social and Behavioral Sciences*, *204*, 164–171. https://doi.org/10.1016/J.SBSPRO.2015.08.129

Mossavar-Rahmani, F., Rahmani, F. M., & Zohuri, B. (2023). The Transformative Impact of AI on Financial Institutions, with a Focus on Banking. *Article in Journal of Engineering and Applied Sciences Technology*, *5*(6), 1–6. https://doi.org/10.47363/JEAST/2023(5)192

Naim, A. (2022). *View of ROLE OF ARTIFICIAL INTELLIGENCE IN BUSINESS RISK MANAGEMENT*. American Journal of Business Management, Economics and Banking. https://www.americanjournal.org/index.php/ajbmeb/article/view/37/26

Odejide, O. A., & Edunjobi, T. E. (2024). AI IN PROJECT MANAGEMENT: EXPLORING THEORETICAL MODELS FOR DECISION-MAKING AND RISK MANAGEMENT. *Engineering Science & Technology*, *5*(3).

Queensland Government. (2022). *SWOT analysis* |. https://www.business.qld.gov.au/running-business/planning/swot-analysis

Sadok, H., Sakka, F., & El Maknouzi, M. E. H. (2022). Artificial intelligence and bank credit analysis: A review. *Cogent Economics & Finance*, *10*(1). https://doi.org/10.1080/23322039.2021.2023262

Samala, N., Katkam, B. S., Bellamkonda, R. S., & Rodriguez, R. V. (2022). Impact of AI and robotics in the tourism sector: a critical insight. *Journal of Tourism Futures*, *8*(1). https://doi.org/10.1108/JTF-07-2019-0065

Saunders, M. N. K., Lewis, P., & Thornhill, A. (2015). *Research methods for business students* (7th ed.). Pearson Education. https://books.google.com/books/about/Research_Methods_for_Business_Students_P.html?id=vUdOCgAAQBAJ

Schwarz, P. J. (2015). Implementation of artificial intelligence into risk management decision-making processes in construction projects. *Universität Der Bundeswehr München, Institut Für Baubetrieb*.

Scott Clayton. (2023). *The Future of Risk Management: How AI is Transforming Decision-Making for Risk Managers*. LinkedIn.

Sokoli, M. (2023). *The Impact of Artificial Intelligence on Finance* [VAASA UNIVERSITY OF APPLIED SCIENCES]. http://www.theseus.fi/handle/10024/812681

Somer, P., & Thalmann, S. (2023). Risk Management of AI in Industry: a Literature Review. *EasyChair Preprint*.

Soravito, G. (2023). *Artificial Intelligence for Risk Management A Systematic Review*. Politecnico di Torino.

Vukšić, V. B., Bach, M. P., & Popovič, A. (2013). Supporting performance management with business process management and business intelligence: A case analysis of integration and

orchestration. *International Journal of Information Management*, *33*(4), 613–619. https://doi.org/10.1016/J.IJINFOMGT.2013.03.008

Zhao, X., Hwang, B.-G., & Low, S. P. (2013). Developing Fuzzy Enterprise Risk Management Maturity Model for Construction Firms. *Journal of Construction Engineering and Management*, *139*(9), 1179–1189. https://doi.org/10.1061/(ASCE)CO.1943-7862.0000712

Appendices 1. Thematic Analysis

#	Document Name	Document	Author	Results
1	**Machine Learning and AI for risk management**	***Book section***	**(Aziz & Dowling, 2019)**	**Provided foundational concepts on AI's application in risk management, focusing on predective accuracy and adaptability.**
2	**Roadmap for Risk Management Integration Using AI**	**Journal**	**(Biolcheva & Valchev, 2022)**	**Outlined strategies for integrating AI into existing risk management frameworks to enhance proactive risk mitigation.**
3	**Audience-Dependent Explanations for AI-Based Risk Management Tools: A Survey**	**Article**	**(Hadji Misheva et al., 2021)**	**Discussed the importance of transparency and explainability in AI tools for risk management.**
4	**Enhancing risk management in hospitals: leveraging artificial intelligence for improved outcomes**	**Journal**	**(Guerra, 2024)**	**Examined AI's impact on hospital risk management and patient safety through data-driven decision-making.**
5	**How AI is shaping the future of Risk Management and compliance**	**Article**	**(Fintech Global, 2023)**	**Highlighted AI's role in transforming compliance processes through automated monitoring and real-time data analysis.**
6	**How Might Artificial Intelligence Applications Impact Risk Management?**	**Journal**	**(Banja, 2020)**	**Explored potential ethical concerns and the need for careful management of AI's influence on risk management practices.**
7	**Artificial Intelligence: The Strategy of Financial Risk Management**	**Journal**	**(Kumar et al., 2024)**	**Focused on AI's application in financial risk management, particularly in credit risk and compliance.**
8	**Harnessing the Power of AI for Enhanced Regulatory Compliance and Risk Management in Fintech**	**Article**	**(Karangara Rajath et al., 2024)**	**Emphasized AI's capabilities in enhancing regulatory compliance and reducing compliance costs in the fintech sector.**
9	**Artificial Intelligence and Bank Credit Analysis: A review**	**Article**	**(Sadok et al., 2022)**	**Provided insights into AI's role in bank credit analysis, enhancing understanding of borrower reliability.**
10	**Challenges of Financial Risk Management: AI Applications**	**Article**	**(Bogojevic Arsic, 2021)**	**Discussed challenges and opportunities AI presents in financial risk management, with a focus on market and credit risk.**
11	**AI in Project Management: Exploring Theoritical Models for Decision-Making and Risk Management**	**Journal**	**(Odejide & Edunjobi, 2024)**	**Analyzed AI's impact on project risk management and decision-making, enhancing operational efficiency and adaptability.**
12	**Risk Management of AI in Industry: A Literature Review**	**Research Paper**	**(Somer & Thalmann, 2023)**	**Reviewed broader industry applications and the inherent risks of integrating AI into business processes.**

This table outlines how the mentioned documents directly impacted the analysis, in the thesis showing how each source helped in comprehending the transformative ability of AI in risk

management across fields. Each entry, in the appendix is connected to sections of the thesis where these contributions are included in the conversation and examination giving a path of the essential literature that backs up the arguments and findings of the thesis.