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Title:
Ai Driven risk management in supply chains during covid 19 in
KSA

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Chapter 1

PRUPOSAL OF THE GRADUATION PROJECT

Introduction

Global supply chains have been severely disrupted by the COVID-19 pandemic, which has also discovered weaknesses that many organizations have been unaware of. Governments imposed social isolation and lockdowns, which drastically disrupted the flow of products and services and created serious operational difficulties for several sectors. Effective risk management is essential for firms trying to navigate uncertainty and preserve continuity under difficult circumstances.

In supply chain management, artificial intelligence (AI) has completely altered the rules. Companies may identify risks, determine how to address them, and remain ahead of the curve with the help of this extremely intelligent robot partner. AI-powered solutions enable businesses to anticipate issues before they arise, ensure they have the necessary resources, and react swiftly to market shifts. The epidemic made it very clear how crucial artificial intelligence is to maintain secure and efficient supply networks. Businesses are now following suit and adopting digital solutions to strengthen their supply chains.

In the context of Saudi Arabia, this thesis investigates the use of artificial intelligence (AI) in supply chain risk management during the COVID-19 pandemic. It seeks to examine how AI technology enhanced decision-making, promoted proactive risk

management techniques, and helped regional companies adjust to hitherto unseen difficulties. The research will demonstrate the benefits of AI applications in reducing supply chain risks during the pandemic through case studies of Saudi businesses and empirical analysis, offering insights into best practices and areas for Saudi market-specific development.

Research problem

Significant weaknesses in Saudi Arabia's supply chains have been made public by the COVID-19 epidemic, which has caused delays in domestic production, import/export operations, and demand forecasting. Operational inefficiencies, logistical bottlenecks, and inventory imbalances are the results of traditional risk management techniques' failure.

The purpose of the study is to investigate the AI techniques and apps that businesses have used to improve their risk management procedures. It will investigate how well these tactics work to enhance supply chain resilience overall, optimize inventory management, and improve demand forecasting. To better prepare for any interruptions, the study will also assess the lessons learnt and suggest frameworks for incorporating AI into supply chain operations going forward.

The importance of the study

This study analyses how, throughout the COVID-19 pandemic, AI may help businesses in managing supply chain risks. It illustrates how crucial it is to be ready for any interruptions. The research provides insights into how to estimate demand,

manage inventories, and ensure domestic manufacturing, imports, and exports are all operating smoothly by examining real-world instances such as Amazon. Both businesses and academics will benefit from this information by using it to make better decisions and maintain satisfied customers.

- **AI in Supply Chain Risk Management:** The study shows how supply chain risk management can be enhanced through the application of AI. It illustrates how operations and decision-making procedures can be altered by AI.
- **Identifying Resilient Supply networks:** The study shows how businesses can strengthen their supply networks. This indicates that they are able to manage upcoming interruptions and continue operating.
- **Precise Demand Forecasting:** Businesses can improve their ability to predict customer demand by utilizing AI-driven forecasting techniques. This enables them to be prepared for market shifts.
- **Improved Inventory Management:** AI can assist businesses in improving inventory control. They can operate more effectively because they don't have too much or not enough material.
- **Improving Domestic Production:** The study shows how artificial intelligence may simplify domestic production procedures. This lets businesses avoid the risks associated with global supply networks and address local demand.
- **Simplifying Import and Export Procedures:** The study demonstrates how AI may simplify import and export procedures. Even when the circumstances around international trade change, this aids businesses in better managing logistics and compliance.

- **Making Strategic Choices** Managers at companies can use the resources provided by this study to make intelligent choices about risk management and technology investments.
- **Customer Being satisfied** Businesses can enhance customer service and make them feel appreciated by optimizing their supply chain, which will increase customer satisfaction and loyalty.

Study objectives

Global supply chains have been severely disrupted by the COVID-19 pandemic, which discovered weaknesses and pushed businesses to implement creative risk management techniques. This study focuses on how artificial intelligence (AI) may improve supply chain resilience, especially in areas like managing inventory, demand forecasting, and import/export operations optimization. Through an analysis of practical implementations, the study looks for effective tactics that can assist companies in facing upcoming difficulties

- Examine AI-related applications

to investigate how supply chain risk management during the COVID-19 pandemic has made use of AI technologies

- Assess Demand Forecasting Methods

to evaluate how well AI-powered demand forecasting techniques predict customer behaviour and manage inventory.

- Examine methods for inventory management

To find out how AI has improved management of inventory, reducing surplus inventory and stockouts

- Examine Improvements in Domestic Production

to look into how AI might improve indigenous production methods and adjust to changes in local demand.

- Examine Import and Export Operations

To determine how AI has improved logistics and compliance throughout the pandemic by streamlining import and export operations.

- Use Case Studies to Determine Best Practices

to find and examine effective case studies of businesses using AI-powered risk management techniques.

- Create Useful Frameworks

to provide workable models for incorporating AI into supply chain risk control in order to increase resilience.

- Examine Policy Recommendations

To give legislators advice and ideas on how to encourage the use of AI in supply chains.

- Add to Academic Knowledge

To improve the scholarly literature on risk management, supply chain management, and the incorporation of technology into corporate operations.

- Improve the Making of Business Decisions

to give company executives data-driven insights so they can make well-informed decisions about technology investments and supply chain strategies.

In summary, this study illustrates how supply chains may be strengthened during emergencies like the COVID-19 pandemic by using AI-driven risk management. Through practical frameworks and insights into best practices, the research gives companies the tools they need to increase operational efficiency and resilience to future challenges

Study questions

The COVID-19 pandemic significantly disrupted supply chains worldwide, particularly in Saudi Arabia, where organizations faced new difficulties. Many responded by enhancing their risk management tactics with artificial intelligence (AI). The purpose of this study is to investigate the AI technologies used, how they detected risks, and the difficulties supply chains faced because of the pandemic. It will also look at case studies of Saudi businesses that have effectively incorporated AI into their operations. And the study questions of this study could be as follows.

- Which AI tools worked most effective for Saudi Arabia's supply chain risk management during the COVID-19 pandemic?

- In what ways did artificial intelligence help identify supply chain problems during the pandemic?
- What unique challenges did COVID-19 present for Saudi Arabian supply chains that made the application of AI to risk management necessary?
- What lessons might be learned from the experiences of the Saudi businesses who effectively incorporated AI into their supply chain operations during the pandemic?

Study hypotheses

The hypotheses of the study act as a kind of road map for investigating the relationship between artificial intelligence (AI) and how it affected supply chain risk management during the COVID-19 pandemic. We're interested to discover how AI technologies improve decision-making, strengthen supply chains, and enhance overall performance in Saudi Arabia. We hope to better understand the elements that contribute to effective risk management and the smart decisions that can be made by incorporating AI into supply chains by developing particular hypotheses.

- Hypothesis 1: AI is supply chain managers' secret tool, facilitating risk reduction in the face of disruptions like COVID-19.
- Hypothesis 2: Businesses that apply artificial intelligence (AI) to control supply chain risks are more stable than those who do not.
- Hypothesis 3: A company's culture and willingness to accept technological shifts determine how well AI-powered supply chain solutions work.
- Hypothesis 4: Supply chains' performance during the epidemic is positively correlated with the amount of AI used.

Previous studies

Worldwide supply chains have been completely disrupted by the pandemic, showing the risk they face and the need for adaptation. According to several studies, artificial intelligence (AI) can assist us in strengthening supply chains' resilience in these challenging times. Studies like the ones conducted in Saudi Arabia demonstrate how Industry 4.0 and AI technology can help us manage risks, make better decisions, and maintain operations. For instance, some studies highlight the value of technology in supply chains, while others demonstrate how AI has assisted us in dealing with crises. In summary, these results suggest that we should increase our use of technological tools, particularly artificial intelligence (AI), to create supply chains that can manage any challenge.

Table 1: Previous studies table

Study name	Brief of the study	Author name	Date
The Role of Big Data and AI in Supply Chain Risk Management	This paper examines the application of AI and big data in supply chain risk management, providing insight into how these technologies operate during disruptive situations such as the COVID-19 pandemic. (Wang, 2016)	(Wang, 2016)	2016
The Impact of Artificial Intelligence on Supply Chain Resilience	This study explores how supply chains are strengthened by AI technology in chaotic circumstances such as the COVID-19 pandemic. (Dubey R. B., 2018)	(Dubey R. B., 2018)	2018
AI and the Future of Supply Chain Management: A COVID-19 Perspective	This study examines how the COVID-19 epidemic has accelerated supply chain AI adoption and altered (Chae, 2020)business	(Chae, 2020)	2020

	operations management.		
Mitigating Supply Chain Disruptions with AI: A Case Study during COVID-19	This case study explores how some businesses utilized artificial intelligence (AI) to streamline their supply chains after the pandemic disrupted them. (Ghadge, 2021)	(Ghadge, 2021)	2021
COVID-19: How Supply Chain Leaders Can Prepare for Future Disruptions	The focus of this article on how supply chain managers may prepare for and manage unexpected events by utilizing technology, such as artificial intelligence. (Company., 2020)	(Company., 2020)	2020
Impact of COVID-19 on the Supply Chain: A Case Study of Saudi Arabia”	The study examines the difficulties encountered and the methods used for addressing them, including the use of technology, as it delves deeply	(Al-Ashban, 2021).	2021

	into how the COVID-19 pandemic has impacted supply chains in Saudi Arabia. (Al-Ashban, 2021)		
Artificial Intelligence in Saudi Arabia: The Future of Supply Chain Management	This essay explores how artificial intelligence (AI) is transforming supply chain management in Saudi Arabia, examining both the potential benefits and drawbacks of implementing it. (Alsharif, 2020)	(Alsharif, 2020)	2020
The Role of Industry 4.0 in Supply Chain Risk Management in Saudi Arabia	This study explores the application of AI and other Industry 4.0 technologies to control supply chain risks in Saudi Arabia. (Alharbi, 2021)	(Alharbi, 2021)	2021
Supply Chain Resilience in Saudi Arabia: The Role of Technology”	This study investigates the factors that contribute to Saudi Arabia's efficient	(Awan, 2021)	2021

	supply chains and how artificial intelligence (AI) is assisting in their continued strength. (Awan, 2021)		
Digital Transformation in Supply Chains: Lessons from COVID-19”	This study examines how the pandemic has sped up supply chain digital transformation, emphasizing the value of artificial intelligence (AI) in boosting operational effectiveness and resilience. (Ivanov D. &, 2020)	(Ivanov D. &, 2020)	2020

Theoretical premises of study

Artificial intelligence (AI) must be included into supply chain risk management, particularly in the wake of interruptions like COVID-19. While the Resource-Based View emphasizes AI as a strategic advantage, other theoretical frameworks, such as Supply Chain Resilience Theory, place more emphasis on adaptability. New theories that demonstrate how AI facilitates real-time decision-making and enhances responsiveness include Agile Supply Chain Theory and Digital Supply Chain

Transformation. When taken as a whole, these theories show how AI might improve supply chain performance by proactively identifying and reducing risks.

Table 2: Theories table

Theory	Description	Author	Date
Supply Chain Resilience Theory	This idea emphasizes how crucial it is for supply chains to be flexible and resourceful to anticipate, prepare for, respond to, and recover from disruptions. (Christopher, 2004)	(Christopher, 2004)	2004
Resource-Based View (RBV)	states that having unique resources and expertise gives businesses a competitive edge and that artificial intelligence (AI) can be a useful tool for increasing productivity. (Barney, 1991)	(Barney, 1991)	1991
Technology Acceptance Model (TAM)	Explains how users accept and utilize technology, concentrating on perceived ease of use and utility as essential elements driving adoption. (Davis, 1989)	(Davis, 1989)	1989

Big Data Analytics Framework	Big data and analytics are crucial for improving supply chain decision-making. Everything runs more smoothly because they assist us in better evaluating and controlling risks. (Waller, 2013)	(Waller, 2013)	2013
Complexity Theory	Explains that supply chains are like living organisms that alter and adapt, and we can utilize AI to make superior choices and maintain strong (McCarthy, 2009)	(McCarthy, 2009)	2009
Dynamic Capabilities Framework	This demonstrates how a business may adjust and modify its competencies to suit unusual situations, with AI assisting them in maintaining its leadership position in risk management. (Teece, 2007)	(Teece, 2007)	2007
Supply Chain Risk Management (SCRM) Models	Create methodical techniques for identifying and addressing supply chain risks while	(Jüttner, 2011)	2011

	using AI to improve forecasting. (Jüttner, 2011)		
Institutional Theory	This study investigates how external forces, such as rules and conventions, influence organizational behavior. It focuses on how these factors affect the adoption of AI, with a particular focus on Saudi Arabia. (DiMaggio, 1983)	(DiMaggio, 1983)	1983
Digital Supply Chain Transformation Theory	brings focus on how AI, IoT, and big data are transforming traditional supply chains into digital ecosystems that improve agility and risk management. (Ivanov D. , 2020)	(Ivanov D. , 2020)	2020
Agile Supply Chain Theory	suggests that AI technologies that enable real-time decision-making enhance supply chain agility, which is the capacity to react quickly to market	Dubey, R., Gunasekaran, A., (Dubey R. G., 2020)	2020

	changes and disturbances. (Dubey R. G., 2020)		
Resilient Digital Supply Chain Theory	combines digitalization and resilience, suggesting that a supply chain driven by digital technology is more resilient and capable of managing disruptions. (Singh, 2021)	(Singh, 2021)	2021
AI-Enhanced Risk Management Theory	This article examines how artificial intelligence (AI) solutions may transform supply chain risk management by providing real-time monitoring and predictive analytics, which will boost productivity and effectiveness. (Choi, 2020)	(Choi, 2020).	2020

Methodologies and research methods

This thesis's methodology will place a strong emphasis on gathering and analysing data about AI-driven risk management in Saudi Arabian supply chains during COVID-19. To provide viewers a thorough grasp of the subject, this study will combine case studies, quantitative, qualitative, and literature review methods. A review of the literature will be the first step, with the goal of laying a theoretical framework by looking at previous research on artificial intelligence in supply chain risk management. To find important themes and gaps in the existing research environment, this procedure involves examining pertinent industry reports and scholarly journals. The framework and goals of the study will be based on the literature review's synthesis of these perspectives.

Surveys will be used for quantitative research to evaluate the level of supply chain AI deployment. Supply chain experts will receive a standardized questionnaire to collect information on the use of AI and how it affects risk management procedures. A quantitative viewpoint on the subject will be provided by the statistical analysis of the gathered data, which will reveal trends and correlations. The main emphasis will be on case studies, while interviews may be done to enhance the results. The purpose of these case studies is to offer specific illustrations of how AI can be used to manage supply chain risks. To identify lessons and best practices, a selection of Saudi Arabian organizations that effectively used AI during COVID-19 will be examined.

With all factors considered, this methodology integrates quantitative data and qualitative insights, enabling a comprehensive investigation of AI's potential to improve supply chain resilience and risk management.

Study tools

Survey questions and a case study framework will be used in my thesis on AI-driven risk management in Saudi Arabia's supply chains at COVID-19. In order to gather information on the extent of AI adoption and its impact on supply chain performance, the survey will include structured questions. To make it easy for anyone to take, I will post it online. I'll also examine a few businesses that employed artificial intelligence in their supply chains throughout the pandemic. This will assist me in locating actual cases and results, which will provide me with important knowledge on how to successfully manage risks. To get the best results, I may conduct some interviews as well, but the survey and case studies will be the primary focus.

Limitation of the study

This study explores how supply chain risk management, particularly during the COVID-19 pandemic, can be improved by artificial intelligence (AI). The study aims to determine the methods that firms adopted to address issues by examining the applications and outcomes of AI technologies. In order to provide us with important insights on how AI may strengthen supply chains during difficult times, the study combines reading books, interviewing individuals, and examining real-world cases. Gaining knowledge of these topics is crucial for enhancing risk management and preparing for any issues in the future.

- Objective limitation: The study could ignore other important elements that affect supply chain performance because it only looks at AI-driven risk management.
- Area limitations: The fact that the study is limited to Saudi Arabia organizations may restrict its ability to apply to other areas.
- Time limitations: The research is limited to 2020–2025, which may mean it overlooks longer-term patterns and advancements in AI.

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