CHAPTER I
PRELIMINARY

1.1 Research Background

In accordance with the trends that we see right now in Supply Chain Management, from (Amine Belhadi, 2024) The ponders have found a positive linkage between trade, data, designing, and analytics to create digitalization and supply chain dangers. Developing advances such as Fake Insights (AI), industry 4.0, added substance fabricating, and progressed item following applications hold critical potential for supply chain (SC) chance analytics, subsequently progressing SCRes (Ivanov et al. 2019). Blockchain, the other data-intensive innovation, can help in moderating the supply chain dangers related to the intermediaries' mediations, counting hacking, compromised security, defenselessness to political turmoil, expensive compliance with government rules and direction, the flimsiness of money-related education, and contractual debate (Cui et al. 2019). A ponder to analyze the effect of information analytics capabilities on SCRes uncovered that data arranging, coordination, and control are the basic enablers of supply chain readiness, readiness, and nimbleness driving SCRes (Mandal 2019). Organizations are required to require an energetic, inventive, and proactive approach to managing dangers. Dangers and disturbances ought to be openings to adapt and advance within the confront of hyper-connected systems, progressed cyber dangers, exceedingly competitive situations, and changing client desires to make strides in the supply chain execution (Butler 2018). The versatile organizations must utilize the mechanical progressions in robotization, AI, and the Web of Things to extend collaboration and participation, both vertically and evenly, inside and remotely (Butler 2018; Kamble et al. 2018). The modern concept of a supply chain, intricately weaving together sourcing, production, distribution, and consumption, may seem like a recent invention. However, its roots stretch back through centuries, evolving alongside human civilization itself. Let's embark on a historical journey, exploring the milestones that shaped the supply chain into the complex, global network we know today.

Globalization and Automation (1920 AD - Present) The post-war era witnessed the rise of globalization. Trade barriers diminished, and multinational corporations emerged, stretching supply chains across borders. Advancements in information technology, like the invention of computers and the internet, further transformed the landscape. Electronic data interchange (EDI) streamlined communication between supply chain partners, while automation, including robotics and AI, began to play a bigger role in production and warehousing according to (https://www.logmore.com/post/history-of-supply-chain-management

Looking Ahead: Resilience and Sustainability (Present - Future) Today, supply chains face unprecedented challenges, from climate change and geopolitical tensions to cybersecurity threats and consumer demands for sustainability. The focus has shifted towards building resilient and sustainable networks. Big data analytics and blockchain technology offer promising solutions for risk management and transparency. As we move forward, the story of the supply chain continues to evolve, shaped by technological advancements, evolving consumer preferences, and the growing need for ethical and environmentally responsible practices. According to businessinsider.com China right now is facing a downfall in their economy due to 4 reasons, China's economy is projected to rebound in 2024 after a sluggish 2023, driven by relaxed COVID-19 restrictions and policy support from Beijing. However, lingering challenges threaten to undermine this growth trajectory. Property sector weakness, still-struggling international trade, and cautious consumer sentiment could limit the speed and scale of China's recovery. Beijing's focus will shift toward stimulating domestic spending to offset the slowdown in exports. Additionally, policy support aiming to revive the crisis-ridden real estate sector is likely. While these measures should provide some stimulus, their effectiveness might be hampered if consumers remain hesitant to spend amidst economic uncertainty. The article highlights risks associated with China's economic outlook, including the possibility of new COVID-19 outbreaks, further disruptions in global supply chains, and geopolitical tensions. These risks have far-reaching implications, as China's economic health plays a significant role in the global economy. Any setbacks in its recovery could reverberate throughout commodity

2

markets, trade flows, and investor sentiment worldwide. Forecasted Growth Amidst Lingering Challenges: China's economy is expected to rebound in 2024 after a sluggish 2023, buoyed by relaxed COVID-19 restrictions and Beijing's supportive policies. However, this anticipated growth isn't without its challenges. The article highlights several factors that could potentially impact the global supply chain:

1.   Weakening Property Sector: China's crisis-ridden property market, a significant contributor to its economic growth, remains a concern. The sector's struggles could ripple through various industries, impacting demand for raw materials and finished goods, potentially leading to disruptions in global supply chains   (https://www.bloomberg.com/news/articles/2023-11-14/china-mulls-137-billion-of-new-funding-to-boost-housing-market). *(full link taruh references, di body tulis sumber: www.bloomberg.com)

2.   Shifting Geopolitical Landscape: Geopolitical tensions and potential trade conflicts could further disrupt global supply chains, currently grappling with recovering from pandemic induced disruptions

(https://www.wto.org/english/news_e/news22_e/miwi_21mar22_e.htm)

3.   China's economic health plays a crucial role in global trade flows, and any setbacks in its recovery could create bottlenecks and price fluctuations in various commodities, impacting businesses worldwide.

4.   Consumer Confidence and Spending: Consumer sentiment in China remains cautious, potentially hindering domestic demand for goods and services. This cautiousness, coupled with the ongoing trade slowdown, could lead to a reduction in China's imports of key raw materials and intermediate goods, affecting production levels and impacting global supply chains (https://www.conference-board.org/topics/consumer-confidence).

5.   Global Implications: As the world's second-largest economy and a major player in global trade, China's economic trajectory has significant implications for the global supply chain.

Any significant disruption in its economic recovery could have cascading effects on various aspects such as:

6. Commodity Markets: China is a major importer of various commodities, and a slowdown in its economic growth could lead to a decrease in demand, potentially impacting global commodity prices.

7. Trade Flows: A sluggish Chinese economy could lead to a decline in global trade volumes, impacting businesses reliant on exports and imports from China.

8. Investor Sentiment: The global economic landscape is highly interconnected, and China's economic outlook can influence investor sentiment worldwide. Uncertainties surrounding China's recovery could lead to increased risk aversion and portfolio adjustments among investors.

A new survey by Carl Marks Advisors and SupplyChainBrain paints a concerning picture of the global supply chain landscape. The research, conducted in July 2022, suggests that complete stabilization of supply chains is unlikely to occur until at least the first half of 2024, or potentially even beyond. This grim outlook highlights the long-lasting impact of the COVID-19 pandemic and other disruptions, raising concerns for businesses and consumers worldwide. The survey reveals several key findings that underscore the ongoing challenges:

Majority Anticipate Disruptions: More than half (53%) of survey respondents did not expect a return to normalcy in supply chains until the first half of 2024 or later. This indicates widespread acknowledgement of the severity and persistence of current disruptions.

Ocean Shipping Remains Most Impacted: Among transportation and logistics segments, ocean shipping emerged as the most affected link, with 68% of respondents reporting negative impacts. This finding aligns with reports of port congestion, container shortages, and rising freight costs that have plagued global maritime trade in recent years.

Revenue and Cost Impacts: The survey emphasizes the significant financial implications of supply chain disruptions. 75% of respondents reported experiencing negative or very negative impacts on their company's revenue within the past year due to supply chain issues. Additionally, 80% reported experiencing cost increases of 20-60% between December 2020 and December 2022, highlighting the inflationary pressures resulting from supply chain bottlenecks.

Global Consequences: The protracted instability in the global supply chain has far-reaching consequences, impacting various facets:

-       Consumer Prices: Consumers around the world are experiencing price hikes due to disruptions in the flow of goods, limited availability of certain products, and increased transportation costs.

-       Business Operations: Businesses are facing challenges in meeting customer demand, managing inventories, and navigating uncertainties in lead times and costs.

-       Economic Growth: The World Trade Organization (WTO) estimates that global trade growth could remain below pre-pandemic levels in 2023 due to supply chain disruptions and other factors.

-       Looking Ahead: Resilience and Adaptability Remain Key

While the projected timeline for recovery may seem distant, the survey underscores the importance of building resilience and adaptability within supply chains. Businesses can explore various strategies to navigate this challenging environment, including those mentioned previously. Additionally, governments and international organizations can play a crucial role in facilitating collaboration, promoting transparency, and investing in infrastructure improvements to strengthen the global supply chain ecosystem. Research by Christopher and Holgate (2011) in the International Journal of Logistics Management emphasizes the importance of Diversification as a key contributor to risk resilience. By diversifying suppliers, transportation routes, and even production locations, companies can mitigate the impact of disruptions concentrated in specific areas. This spreads risk and ensures

continued operations even when faced with localized challenges. Information Sharing and Visibility, alongside diversification, strong communication, and information sharing are crucial for building a resilient supply chain. As highlighted by (Ivanov et al. 2020) in the Journal of Business Logistics, real-time visibility and information exchange across the entire supply chain network allows for proactive risk identification and mitigation. This includes sharing data on inventory levels, potential disruptions, and alternative sourcing options, enabling swift and coordinated responses to challenges. Investment in Technology, Technological advancements play a vital role in bolstering supply chain resilience. A study by Gunasekaran et al. (2019) in the International Journal of Production Economics explores the potential of Big Data analytics and artificial intelligence. These technologies empower companies to analyze vast amounts of data, predict potential disruptions, and optimize decision-making, ultimately leading to a more agile and responsive supply chain. Building Strong Partnerships, building strong partnerships with suppliers, distributors, and other stakeholders is essential for achieving supply chain resilience. As emphasized by Jüttner et al. (2003) in the Supply Chain Management: An International Journal, collaborative relationships foster trust, transparency, and joint problem-solving. This allows for coordinated efforts in mitigating disruptions, sharing resources, and ensuring continued flow of goods during challenging times. The concept of "resilience" cuts across various disciplines, taking on different shades of meaning depending on the context. In the realm of physics and engineering, it refers to a material's ability to regain its original shape after being deformed (Pytel & Kiusalaas, 2016). In ecology, it describes the extent, manner, and pace of an ecosystem's recovery from disruption and restoration of its original structure and function (Westman, 1986). Meanwhile, within social systems, it defines the capacity of communities or societies to adapt and function effectively even in the face of significant dangers. Across these various domains, a common thread emerges: the essence of resilience lies in the ability not just to withstand disruptive events but also bounce back from them(Namdar, 2017). This core concept has found increasing relevance in the organizational context, particularly due to the frequency of disruptive global events in recent years.

Organizational resilience, then, is defined as the capacity to adapt and maintain essential functions, even under challenging conditions (Bunderson & Sutcliffe, 2002). Hamel and Valikangas (2002) expand on this notion, defining it as the organization's capability to evolve rapidly without experiencing detrimental effects. Achieving such resilience necessitates a continuous cycle of reconstruction and fostering innovation, allowing the organization to not only survive but also thrive in the face of disruption.

Supply Chain Disruption, in today's interconnected and dynamic global economy, supply chains are constantly exposed to various disruptive forces. These disruptions, ranging from natural disasters and pandemics to geopolitical tensions and technological shifts, can significantly hinder the flow of goods and services, leading to financial losses, reputational damage, and customer dissatisfaction. However, amidst these challenges emerges a crucial concept: Supply Chain Risk Resilience (SCRR). SCRR refers to the ability of a supply chain to predict, absorb, adapt to, and recover from disruptions. It's a dynamic capability that enables businesses to not only weather the storm of disruptions but also emerge stronger and more adaptable. The following paragraphs will delve into the intricate relationship between supply chain disruptions and SCRR, highlighting the critical role of resilience in mitigating the negative impacts of disruptions and fostering long-term sustainability.

- Identifying and Proactively Addressing Potential Disruptions, SCRR starts with the ability to identify and assess potential disruptions proactively. By implementing robust risk management frameworks and utilizing data analytics tools, companies can anticipate potential threats and vulnerabilities in their supply chains. This proactive approach allows for the development of contingency plans and mitigation strategies, minimizing the initial impact and facilitating a quicker recovery from disruptions (Mahour Parast, 2020).

- Building Flexibility and Agility, a core element of SCRR lies in fostering flexibility and agility within the supply chain. This involves diversifying sourcing options, building buffer inventory, establishing redundancies in key processes, and adopting agile manufacturing practices. These measures enable companies to adapt to disruptions by quickly scaling up or down production, switching suppliers, or utilizing alternative transportation routes, thereby minimizing the disruption's duration and severity (Parast, M.M., Sabahi, S., Kamalahmadi, M. (2019).

- Leveraging Technology for Enhanced Visibility and Collaboration: Technological advancements play a significant role in enhancing SCRR. Big Data analytics, artificial intelligence, and real-time information-sharing platforms empower companies to gain greater visibility across their supply chains. This allows for the identification of potential issues, proactive communication with stakeholders, and collaborative problem-solving, facilitating a more coordinated and efficient response to disruptions (Kshetri, 2017)

- Building Strong Partnerships and Collaborative Relationships, fostering strong partnerships and collaborative relationships throughout the supply chain network is crucial for building SCRR. By engaging in open communication, sharing information, and working together, various stakeholders can collectively respond to disruptions more effectively. This collaborative approach fosters trust, transparency, and a sense of shared responsibility, allowing for the joint allocation of resources and the development of more robust solutions in the face of disruptions (Kenneth W. Green Jr, 2012)

- Continuous Learning and Improvement, a crucial aspect of SCRR lies in continuous learning and improvement. By actively learning from past

disruptions, analyzing their impacts, and adapting strategies accordingly, companies can build a more resilient and adaptable supply chain over time. This involves continually evaluating and updating risk management frameworks, exploring new technologies, and fostering a culture of innovation and learning within the organization.

IT Resilience on the other hand, in today's digitally driven world, where information technology (IT) underpins virtually every aspect of business operations, the synergy between IT resilience and supply chain risk resilience (SCRR) has become more critical than ever. Disruptions in either domain can have cascading effects, jeopardizing operational efficiency, financial stability, and ultimately, customer satisfaction. However, by fostering a robust and interconnected approach to both areas, businesses can achieve greater agility and preparedness in the face of unforeseen challenges.

- Building a Digital Backbone for a Resilient Supply Chain:

    A foundational aspect of this synergy lies in leveraging IT to bolster SCRR. Robust IT infrastructure forms the backbone of efficient and transparent supply chain processes. Advanced technologies like cloud computing and Internet of Things (IoT) applications enable real-time data visibility across the supply chain network, allowing for proactive risk identification and predictive maintenance. This empowers businesses to anticipate potential disruptions, such as equipment failure or transportation delays, and implement necessary mitigation strategies beforehand (Tsan-Ming Choi, 2016)

- Ensuring Security and Data Integrity for Smooth Flow:

    IT security plays a vital role in safeguarding the integrity of data and information flow within the supply chain network. Cyberattacks targeting critical infrastructure or sensitive data can cripple operations and disrupt the flow of goods. Implementing

9

robust cybersecurity measures, including firewalls, intrusion detection systems, and data encryption, is crucial for mitigating these risks and ensuring uninterrupted information flow across the supply chain (ryder.com/2023).

- Enabling Collaboration and Communication for Effective Response:

IT facilitates communication and collaboration across the entire supply chain ecosystem, including suppliers, distributors, and customers. Cloud-based collaboration platforms and video conferencing tools enable real-time information exchange, allowing stakeholders to share critical updates, coordinate responses to disruptions, and collaboratively minimize their impact (gep.com/2021).

- Leveraging Big Data and Analytics for Improved Decision-Making:

In an era of data abundance, Big Data analytics and machine learning capabilities provide valuable insights to support strategic decision-making in the context of SCRR. By analyzing vast amounts of data from various sources, businesses can identify patterns, predict potential disruptions, and optimize resource allocation. This data-driven approach allows for informed decision-making and proactive risk mitigation strategies, ultimately fostering a more resilient supply chain (Seetha Raman, 2018)

- Continuously Evolving and Adapting to Emerging Challenges:

The landscape of both IT and supply chain management is constantly evolving. As new technologies emerge and security threats morph, it's imperative for businesses to continuously adapt and improve their IT infrastructure and SCRR strategies. This

10

necessitates investments in ongoing training, skills development, and technology upgrades to ensure the workforce possesses the necessary skills to utilize advanced tools and technologies effectively, safeguarding both IT systems and the broader supply chain network (Muhammad Saeed Shahbaz, 2017)

Building a resilient supply chain is no longer a luxury, but a necessity. This resilience translates to the ability to anticipate, adapt to, and recover from disruptions with minimal impact on business operations.

Talking about **Big Data analytics**, a powerful force transforming the way businesses manage risk and navigate the uncertainties inherent in today's globalized supply chain. By leveraging vast datasets, advanced analytics techniques, and powerful computing capabilities, Big Data offers valuable insights that can significantly enhance supply chain risk resilience (SCRR) in several key ways:

- Enhanced Risk Identification and Proactive Mitigation, big Data analytics empowers businesses to uncover hidden patterns and trends within vast amounts of data, including historical data, real-time sensor readings, and social media sentiment analysis. This predictive capability allows companies to identify potential disruptions well before they occur, enabling proactive mitigation strategies to be implemented. For example, by analyzing weather data and historical shipping records, companies can anticipate potential delays caused by weather events and adjust their transportation routes accordingly
(S. K. Sarpong, et al, 2021)
- Improved Decision-Making and Resource Allocation, by analyzing various data sources, including supplier performance, inventory levels, and market dynamics, Big Data analytics can provide organizations with comprehensive insights to inform strategic decision-making related to supply chain management. This empowers businesses to optimize

resource allocation, prioritize resources towards mitigating high-impact risks, and allocate resources efficiently to build buffer inventory or diversify sourcing options.

- Enhanced Visibility and Transparency, big Data analytics facilitates real-time visibility across the entire supply chain network, providing a clear picture of inventory levels, transportation schedules, and potential bottlenecks. This level of transparency allows for early detection of disruptions and enables coordinated responses from various stakeholders within the supply chain ecosystem, minimizing the impact and facilitating faster recovery (bcg.com/2022).

- Data-Driven Collaboration and Communication, big Data analytics fosters data-driven collaboration and communication among various actors within the supply chain, including suppliers, distributors, and customers. By sharing relevant data and insights, stakeholders can collectively assess risks, develop mitigation strategies, and respond to disruptions more effectively. This collaborative approach fosters trust, transparency, and a sense of shared responsibility, leading to improved overall supply chain resilience.

- Continuous Learning and Improvement, big Data analytics enables continuous learning and improvement within the SCRR framework. By analyzing historical data on past disruptions and their impacts, organizations can identify areas for improvement in their risk management strategies and adapt their approaches to become more resilient over time. This iterative process allows for continual refinement and optimization of SCRR strategies, ensuring preparedness for future disruptions.

The intricate relationship between supply chain disruptions (Y), and the various aspects you've explored, including risk resilience definitions (X1 - general), IT resilience (X2), and Big Data analytics (X3), paints a compelling picture of the interconnectedness of these critical concepts.

This research thus far has established a solid foundation for understanding these crucial aspects and their intricate correlations. As I delve deeper into exploration, the potential to uncover novel insights and develop innovative strategies for building robust and adaptable supply chains in the face of evolving challenges becomes even more evident. My continued research holds significant value in contributing to the ongoing discourse and offering practical solutions for organizations navigating the complexities of the modern business environment. By further investigating these connections, I have the potential to contribute meaningfully to the field of supply chain management and equip businesses with the tools and understanding necessary to thrive in the face of unforeseen disruptions.

1.1.2 Literature Review

The need for deeper, data-driven insights into supply chain risk and resilience is repeatedly echoed throughout the literature. As early as 2007, (Kahn and Burnes 2007) urged researchers to move beyond theoretical frameworks and delve into the real-world application of risk management approaches and tactics to improve supply chain resilience. This call was further amplified by (Sohdi *et al*. 2012) who emphasized the importance of empirical and event-based research to capture the nuances of real-world disruptions and their impact. More recently, in 2020, (Scholten *et al*. 2020) reiterated this point within this very journal, highlighting the scarcity of empirical studies on supply chain resilience and the prevalence of conceptual models in the existing literature. This repeated emphasis underscores the critical need for research that leverages concrete data and real-world events to advance our understanding of building resilient supply chains in the face of evolving risks and disruptions. Several industry reports, including those by (Capgemini (2016) and EY (2016), paint a clear picture of digital transformation driving the future of supply chains within the next five years. Defined as the development of information systems and adoption of innovative technologies, digital supply chains aim to strengthen integration and agility, ultimately enhancing customer service and organizational sustainability. This future envisions integration of cutting-edge technologies like augmented reality, big data, and blockchain, all focused-on customer needs, minimizing both internal and external costs, and creating greater organizational value (Ageron *et al.* (2020).

The COVID-19 pandemic sent shockwaves through global supply chains, causing widespread disruptions, and forcing businesses to scramble for adaptation (Ivanov & Dolgui, 2020a, 2020b, 2021; Queiroz et al., 2020). Navigating and responding to these unprecedented conditions proved extremely challenging (El Baz & Ruel, 2021; Paul & Chowdhury et al., 2021; Ivanov, 2021b; Wieland, 2021). While research efforts have shed light on predicting the pandemic's impact (Ivanov, 2020a) and analyzing supply chain adaptation during the crisis (Ivanov, 2021b; Yang et al., 2021), a crucial gap remains in understanding how supply chain

14

management evolves during pandemic elimination and subsequent post-disruption recovery. Ivanov (2020a) and Paul & Chowdhury (2021) highlight the extended and unpredictable nature of pandemic disruptions, contrasting them with other disruptions typically characterized by immediate impact and short recovery periods. Unlike these "instant event" disruptions, like natural disasters, the pandemic presents a gradual degradation and recovery profile, potentially offering more time for adaptation (Ivanov, 2021b; Nagurney, 2021). This extended timeframe, paired with the potential for forecasting its dynamics via models like SIR (e.g., Ivanov, 2021b), may enable supply chains to adopt mitigation strategies that differ from those employed for rapid disruptions. The long-lasting and gradual nature of this pandemic-driven disruption profile also opens doors for unique insights not typically observed in traditional disruption analyses, potentially avoiding the "disruption tails and overlays" often associated with shorter, more intense disruptions. Given the rapid evolution of internet technologies over the past 20 years, focusing on this timeframe will likely capture the most relevant research on disruptive technologies across various contexts, including supply chain management. However, it's important to acknowledge that disruptive technologies also attract attention from diverse research disciplines like computer science, management science, and information systems. Therefore, a comprehensive understanding may require exploring broader literature beyond supply chain management specifically (Bo Li *et al.* 2018). Despite its widespread adoption and diverse applications, pinning down a single definition for Big Data Analytics (BDA) remains a challenge. A commonly accepted understanding describes BDA as "a new generation of technologies and architectures built to economically extract valuable insights from massive volumes and diverse data types. This is achieved through high-speed data capture, exploration, and analysis" (Mikalef et al., 2018, p. 2).

The fabric of global commerce hangs precariously, threatened by a tapestry of disruptions both familiar and unforeseen. From the escalating tremors of climate change to the ever-shifting sands of geopolitical tensions, traditional supply chains face a future fraught with vulnerabilities. The recent floods in Pakistan, for instance,

15

offer a stark reminder of climate's wrath, severely impacting textile production and global cotton supply (E360, 2024). Meanwhile, the ongoing war in Ukraine highlights the fragility of regionally reliant chains, prompting companies to diversify their sourcing strategies for improved resilience (Wall Street Journal, 2024). Yet, amidst this brewing storm lies an opportunity to reimagine, to weave a new tapestry of resilience using the potent thread of big data analytics. This thesis delves into the uncharted territory of this data-driven future, venturing beyond the familiar terrain of mitigating current disruptions. We cast our gaze towards proactive resilience, exploring emerging threats like climate-induced supply shocks and unforeseen cyberattacks. How can big data analytics become our crystal ball, illuminating the path to preemptive action? Furthermore, we transcend the insular focus of individual companies, venturing into the collaborative realm of network resilience. Here, we seek to unravel the secrets of forging interconnected, data-driven ecosystems where information flows freely. Imagine a future where collective preparedness and swift, unified responses to adversity become the hallmarks of supply chains. This vision compels us to analyze potential ethical dilemmas related to data sharing, privacy, and trust within these collaborative networks, ensuring that big data fosters collective resilience ethically (World Bank, 2023).

The data paints a stark picture of the challenges we face. The World Bank's Supply Chain Disruptions Database reveals a rising tide of disruptions, ranging from natural disasters like the recent floods in Pakistan that severely impacted global cotton supply (World Bank, 2023) to geopolitical tensions exemplified by the ongoing war in Ukraine, highlighting the vulnerability of regional dependencies (Wall Street Journal, 2024). Additionally, the frequency and cost of cyberattacks on critical infrastructure are documented by sources like PwC's Global CEO Survey, underlining the need for enhanced cybersecurity measures powered by BDA (PwC, 2023). Technological advancements also play a crucial role in shaping the future of supply chains. Artificial Intelligence (AI) is revolutionizing the field

16

with predictive analytics and automated decision-making, as evidenced by data on its growing adoption (McKinsey Global Institute, 2013). Blockchain technology offers unprecedented transparency and traceability, as seen in its implementation in specific industries (McKinsey Global Institute, 2013). The Internet of Things (IoT) empowers real-time monitoring and risk identification through sensor-equipped devices, as highlighted by data on its growing adoption (McKinsey Global Institute, 2013). However, these advancements come with their challenges. Issues of bias and explain ability in AI algorithms need careful consideration, while concerns regarding scalability and data privacy in blockchain implementations must be addressed. The integration of human expertise with data-driven insights from IoT also requires careful navigation. Beyond technological considerations, the economic and social landscape presents further challenges. Reshoring and nearshoring trends, as documented by data sources, indicate a shift towards regionalization in response to risk concerns (McKinsey Global Institute, 2013). Additionally, rising consumer and investor demands for sustainable practices necessitate the optimization of supply chains for both environmental and social responsibility, as highlighted by data on the growth of "green" logistics and ethical sourcing (Yale University, 2023).

The global landscape of supply chains stands at a crossroads, buffeted by waves of disruption and propelled by technological revolution. Climate change unleashes its fury, geopolitical tensions weave a web of uncertainty, and cyber threats lurk in the shadows. Recognizing the urgency of this evolving scenario, this literature review has delved into the challenges and opportunities presented by Big Data, disruption, and the construction of resilient networks. Our exploration has painted a vivid picture of the complexities facing supply chains. Disruptions, documented by sources like the World Bank and Wall Street Journal, pose a constant threat, highlighting the need for proactive solutions. This review further emphasizes the vital role of Big Data Analytics (BDA) in mitigating these risks, as evidenced by studies from PwC. On the technology front, advancements like AI, Blockchain, and IoT offer promising avenues for building more resilient networks, as data from McKinsey Global Institute suggests.

However, navigating this dynamic landscape requires more than just isolated pieces of technology. By synthesizing these research findings, a clear vision emerges: the future of supply chain risk management lies not in individual solutions, but in synergistically leveraging Big Data, anticipating disruptions, and fostering collaborative, data-driven networks. This comprehensive approach holds the key to proactively mitigating risks, building resilience, and navigating the turbulent waters of an ever-changing world.

This review serves as a springboard for further research, laying the groundwork for exploring:

- Emerging technologies: How can cutting-edge advancements like quantum computing and blockchain interoperability further enhance resilience?
- Human-machine collaboration: How can we effectively combine human expertise with data-driven insights for optimal risk management?
- Ethical considerations: How can we ensure responsible and equitable use of Big Data in building resilient networks?

By addressing these questions, we can unlock the full potential of Big Data and technology, forging a future where supply chains not only withstand disruptions but thrive amidst them. With this vision in sight, we embark on the next chapter of our research journey, ready to build a future where resilience reigns supreme.

1.2 Research Formulation and Research Questions

Our world faces a multitude of evolving threats with the potential to cripple supply chains. Extreme weather events and changing climate patterns, exemplified by the recent devastating floods in Pakistan that impacted global cotton supply, are becoming increasingly frequent and disruptive. Geopolitical tensions, like the ongoing conflict in Ukraine, expose vulnerabilities in regional dependencies, prompting companies to diversify sourcing strategies. Furthermore, the escalating threat of cyberattacks on critical infrastructure poses a significant risk to supply chain operations. Fortunately, the field of Big Data Analytics offers promising solutions. By analyzing data on the frequency and severity of these disruptions, we can gain valuable insights for predicting and mitigating their impact(PWC's Global CEO Survey/2023). Exploring data on trade flows and protectionist policies can inform strategies for diversifying sourcing and building regional resilience. Additionally, analyzing the landscape of cyberattacks on logistics, manufacturers, and critical infrastructure can pave the way for developing more robust cybersecurity measures and detection systems. This research delves into the potential of Big Data Analytics to empower proactive risk management and build resilient supply chains in the face of these complex and ever-evolving challenges.

Based on the research gap that I found before I created this thesis and found by researching on several multinational companies, hereby I attached a few of the questions I found:

1. What are the most significant disruptions specific to the logistics industry, considering their frequency, severity, economic impact, and their environmental implications?

2. How can Big Data Analytics be used to identify, predict, and assess potential disruptions within the logistics context, considering both economic and environmental impacts?

3. What are the key challenges and ethical considerations in implementing Big Data-driven risk management strategies in logistics companies with a focus on environmental sustainability?

4. What are the characteristics of resilient logistics networks in the context of Big Data Analytics, disruption, and environmental sustainability?

5. How can the effectiveness of Big Data-driven risk management strategies be measured and evaluated within the logistics industry, considering their impact on both disruption preparedness and environmental sustainability?

1.3 Research Objectives

Based on the problem formulation and questions used in this research, there are objectives as answers to the questions contained in the problem formulation of this research, these objectives are:

1. Identify and analyze emerging disruptions. Utilize Big Data Analytics (BDA) to uncover potential disruptions not yet addressed in existing literature, such as the long-term impacts of climate change or unforeseen technological advancements. Develop proactive BDA-driven strategies. Leverage BDA to build resilience against these future disruptions, potentially through early warning systems, risk prediction models, or adaptable supply chain designs.

2. Optimize network design for resilience, Integrate BDA into network design to enhance adaptability and responsiveness, enabling proactive adjustments to unforeseen challenges.

3. Build resilient partnerships and ecosystems by utilizing BDA to create data-driven trust and transparency within the network, leading to resilient partnerships and ecosystems, also address ethical considerations to explore and address ethical concerns related to data sharing, privacy, and

trust within collaborative networks, ensuring the ethical implementation of BDA for collective resilience.

4. Integrate emerging technologies, and examine how blockchain, artificial intelligence, and other emerging technologies can be combined with BDA to further enhance future-proofed supply chain networks. By balancing human expertise with BDA, investigate effective approaches to balance human expertise with data-driven insights from BDA for optimal risk management and decision-making.

5. Analyze economic and social implications, and assess the economic and social implications of building resilient networks in the post-pandemic context, considering factors like reshoring, sustainability, and job displacement. Optimize for both risk and sustainability, utilize BDA to optimize supply chains for both risk mitigation and environmental responsibility, addressing broader sustainability aspects like resource efficiency and carbon footprint reduction.

1.4 Research Advantages

Therefore, I expect that my thesis will bring positive advantages to whoever reads this thesis. My expectations for this research are as:

- **Educational Advantages**

    Deeper understanding of supply chain challenges. My research will give a comprehensive understanding of the various challenges faced by supply chains today, including climate change, geopolitical tensions, cyber threats, and technological disruptions. This knowledge will be valuable in any career related to supply chain management, logistics, or

21

risk management. My research will gain expertise in using Big Data Analytics (BDA) to identify, predict, and mitigate supply chain risks. This is a highly sought-after skill in today's job market, as businesses are increasingly turning to BDA to make better decisions. My research will require you to develop strong problem-solving skills, as you will need to identify complex challenges and develop innovative solutions using BDA. These skills will be valuable in any career, not just in supply chain management. As I continue to research and write this thesis, everyone will need to stay up to date with the latest trends in supply chain management, BDA, and risk management. This will help you to stay ahead of the curve in your career.

- **Practical Advantages**

    Proactive identification and prediction of potential disruptions This research can inform the development of early warning systems and risk prediction models, empowering organizations to anticipate and prepare for future challenges before they strike. Improved collaboration information sharing, and collaborative risk management strategies using BDA can lead to a more unified and effective response to disruptions across the entire supply chain network. Reduced losses and disruptions, proactive risk management, and a resilient network design can significantly reduce business disruptions, leading to cost savings and improved efficiency. Data-driven optimization for both risk and sustainability by analyzing the environmental impact of various strategies allows organizations to build resilient networks that are also eco-friendly and resource-efficient. Improved brand reputation, by demonstrating leadership in building resilient and sustainable supply chains can attract customers and investors who value these aspects. This research holds significant implications for companies seeking to enhance their supply chain performance in today's dynamic and unpredictable world. By delving deeper into the intricate relationships between supply chain disruptions, SCRR (Supply Chain Risk

22

Resilience), and the various aspects you have explored, companies can gain valuable insights and develop actionable strategies to navigate these complexities effectively. For instance, understanding the correlations between disruptions and resilience can empower companies to proactively identify potential risks and implement mitigation strategies before disruptions occur. This could involve diversifying supplier bases, investing in advanced technologies like Big Data analytics for better risk prediction, or fostering stronger collaborative relationships throughout the supply chain network. Additionally, exploring the synergy between IT resilience and SCRR can guide companies in building robust IT infrastructure that can withstand unforeseen challenges and ensure uninterrupted information flow, a critical aspect of efficient and responsive supply chain management.

1.5 Research Limitations

While striving for accurate and impactful results, this research acknowledges several inherent limitations. Firstly, it focuses on a specific target group:

1. *The research started from 27 January – 27 April 2024*
2. Participants must've worked in similar industries with a minimum of 1 years of experience.
3. Data are collected by an online platform; I mean the online platform is Google Forms.
4. Microscopely small access to relevant and high-quality data from real-world supply chain operations can be challenging due to confidentiality concerns, data-sharing practices, and limitations of existing data sets.
5. Utilizing BDA in collaborative risk management raises ethical concerns around data privacy, security, and potential biases within algorithms.

6. Area coverage might be out of Indonesia's border due to the very broad specific need for survey and research requirements, but limited to South East Asia.

7. This research is limited to broad objects which is Supply chain risk resilience.

1.6 Writing Systems

This research unfolds in five distinct yet interconnected chapters, each fulfilling a specific role in building a comprehensive understanding of resilient supply chain networks with Big Data and risk management. The chapters weave together seamlessly, ensuring a structured and logical flow of information. While each chapter serves its own focused purpose, they remain unified, contributing to the overarching research goals. This organized structure fosters a holistic exploration of the topic, guiding the reader through various facets and ultimately reaching insightful conclusions:

1. **Chapter I: Introductions**

   The first chapter, aptly named "Introduction," serves as the foundation for this research journey. It paints the background that sparked your curiosity, highlighting the problem that demands investigation. From this problem, intriguing research questions emerge, guiding your exploration toward impactful answers. The chapter wouldn't be complete without outlining the valuable contributions your research promises, acknowledging any limitations it might face, and unveiling the systematic structure that will guide your reader through your discoveries. In essence, this introductory chapter sets the stage for a captivating voyage into the world of resilient supply chain networks empowered by Big Data and risk management.

2. **Chapter II: Theoretical Basis**

   Chapter II, the "Theoretical Basis," delves into the intellectual bedrock of my research. Here, I'll embark on a meticulous literature review, carefully examining existing theories and concepts that illuminate the key elements

of my study: supply chains, Big Data, disruptions impacting them, and the concept of resilience networks. This critical review lays the foundation for the conceptual framework, a unique lens through which I'll view my research subject. Additionally, this chapter will unveil the well-formulated hypotheses, serving as guiding lights for my investigation and driving me toward insightful conclusions.

3. **Chapter III: Research Methodology**

Chapter III, the "Research Methodology," dives into the heart of my investigation, outlining the roadmap I'll follow to uncover valuable insights. I begin by defining the population and sample groups I'll target, ensuring my research is focused and relevant. Next, I meticulously select the "objects" or entities I'll examine, whether it's specific supply chain processes, data sets, or organizational structures. This chapter is where I unveil my chosen research design, whether it's a quantitative or qualitative approach or a creative blend of both. The journey doesn't end there; I delve into the specific techniques I'll employ to collect data, ensuring it's accurate and comprehensive. Finally, I shed light on how I'll process and analyze this data, transforming it into meaningful knowledge that answers my research questions. In essence, Chapter III becomes the blueprint for my research endeavors, guiding me toward a successful and impactful exploration.

4. **Chapter IV: Results and Analysis Study**

In Chapter IV, "Analysis and Discussion," I'll unveil the fruits of my data-gathering efforts. I'll present and explain the results I've meticulously collected, ensuring transparency and clarity. These findings will be woven into the tapestry of theory I established in Chapter II, carefully examining how they connect and illuminate each other. By drawing insightful connections between data and theory, I'll strive to solve the problem I initially identified, seeking to validate or refine my hypotheses and ultimately answer the crucial questions that drive this research. This chapter is where the puzzle pieces come together, forming a comprehensive picture

of how Big Data and risk management can empower resilient supply chain networks.

5. **Chapter V: Conclusions and Advice**

Chapter V, "Conclusions and Suggestions," marks the culmination of my research journey. Here, I proudly share the conclusions I've reached, drawing upon the insights gleaned from my analysis and discussions. These conclusions will not only answer the questions that guided me but also offer valuable takeaways and implications for the field. Additionally, I'll extend the conversation by presenting suggestions for future research. These suggestions are not mere afterthoughts; they are carefully considered pathways for further exploration, building upon the foundation I've laid. By sharing my conclusions and suggestions, I hope to inspire future research and contribute to the ongoing development of resilient supply chain networks in the ever-evolving world we face.