

BAB II

THEORETICAL BACKGROUND

2.1 Theory Observation

This thesis investigates the complex interplay between three key variables: Institutional Responses to Supply Chain Disruptions (X1), IT Infrastructure Capability (X2), and Big data analytics Capability (X3), all of which play crucial roles in enhancing the overall resilience of supply chains in the face of disruptions. By analysing the intricate relationships between these variables, this research aims to shed light on how they collectively contribute to building robust and adaptable supply chains, ensuring sustained operational efficiency and success in the dynamic landscape of global business.

2.1.1 Institutional Responses to Supply Chain Disruptions

They were saying that the strength field emerged as a supplement to the conventional probabilistic chance evaluation approach, which has solid confinements in analyzing numerous sorts of real-life frameworks, especially complex frameworks that are characterized by huge instabilities and the potential for shocks (Arven, 2018). In light of these crevices, the most important reason for this think about is to distinguish the key inner SC hazard components (i.e. sourcing, manufacturing, and conveyance dangers) within the global environment and investigate fitting relief methodologies to realize superior supply chain strength capability. Utilizing SC versatility as an energetic capability and an expansion of the conventional asset-based see (RBV), the ponder looks at how worldwide SC dangers impact SC versatility and capability and examine the part of hazard administration techniques through factual examination (Han, 2020). By managing supply chain resilience through this dynamic capability view, firms can meet the requirements for an agile, adaptable, and aligned supply chain (Lee, 2004) as the view calls for developing appropriate capabilities and reconfiguring resources within firms (Chowdhury and Quaddus, 2017) (Han, 2020). We begin the discourse of the two points of

view on flexibility by advertising an elective definition of flexibility to the SCM community. Various definitions of supply chain resilience in the sense of designing resilience already exist. Our elective is subsequently a definition that translates supply chain versatility within the, so distant, often overlooked sense of social-ecological versatility (Wieland, 2021). Following previous talks about within the field of biology (Folke, 2006; Walker, 2020), we rethink supply chain versatility as follows: Supply chain versatility is the capacity of a supply chain to hold on, adjust, or change within the confront of alter (Wieland, 2021).

Driven by globalization and the appropriation of incline operations, supply chains are getting to be progressively complex and the commerce substances that constitute them are progressively subordinate to one another. Such complex and firmly coupled supply chain systems are exceptionally helpless to be disturbed since a localized disturbance, happening anyplace inside the arrangement, can effectively proliferate to other firms (Bode and Wagner, 2015; Ivanov et al., 2014; Pettit et al., 2013). Moreover, based on the ordinary mishap hypothesis, such disturbance occasions are both unavoidable and to a great extent eccentric (Perrow, 1999; Scheibe and Blackhurst, 2018) (Yuhong Li, Network Characteristics and Supply Chain Resilience under Conditions of Risk Propagation, 2019). Centering on organized characteristics has the potential to address the over restriction. An organized characteristic portrays one aspect of the arranged structure. For illustration, the clustering coefficient measures the degree to which hubs in an organization tend to cluster together, and the normal way length gives the normal length of the briefest way between any match of hubs. Since any sort of arrangement can continuously be depicted by a bunch of organized characteristics, we accept it is sensible to assume that a set of arranged characteristics may more successfully speak to a "genuine" supply chain arrangement than would be conceivable by utilizing the arrange sort alone. More critically, it is these person-arranged characteristics, instead of the organized sort, that a supply chain supervisor can alter to make strides in the supply chain structure (Yuhong Li, Network Characteristics and Supply Chain Resilience under Conditions of Risk Propagation, 2019).

2.1.2 IT Infrastructure Capability

SCN structure has been well recognized as a deciding figure for SCNR (Kristianto et al., 2012; Snyder et al., 2012), and thinks about of the concept have been conducted from both a hypothetical and a quantitative viewpoint. From the hypothetical point of view, it is commonly considered that a supply chain could be a complex organize (Carter et al., 2015), and it is recommended that the development of a SCN consider not fair the obvious skyline boundary of the central firm (Carter et al., 2015) but too the scope of supply chain administration (Lambert et al., 1998). In expansion, the structure of a supply chain organize may be characterized in terms of the person supply chain individuals and the method joins (Lambert et al., 1998; Borgatti and Xun 2009) or from an in general organize viewpoint, and it can incorporate thought of such concepts as inner self systems (Borgatti and Xun 2009), sets of three (Choi and Wu, 2009), and particular arrange properties (Kim et al., 2011; Borgatti and Xun 2009; Choi and Krause, 2006; Choi et al., 2001) (Yuhong Li a, 2020) The ponders have found a positive linkage between the 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 offer assistance in moderating the supply chain dangers related to the intermediaries' mediations, counting hacking, compromised security, defencelessness 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 complex nature of cutting-edge supply chain systems can make them challenging to ponder. For illustration, *Ford* has 1400 tier-one providers and up to 10 levels of providers (Simchi-Levi et al. 2015), *Nike's* three-tier SCN contains 4036 hubs and 10,949 edges, and Common Mills' three-tier organize has 1496 hubs and 4908 edges (Orenstein, 2016). Reacting to this complexity, this segment characterizes a system for measuring SCNR, in arrange to permit for investigation of the strength behavior of such systems. We see the supply chain as a complex arrangement in which hubs speak to firms within the supply chain and joins speak to the intuitive supply connections between those firms (Carter et al., 2015; Basole and Bellamy, 2014; Zhao et al., 2019). From the point of view of modelling chance engendering, we see SCN as undirected since disturbance dangers can diffuse from both the supply side and the request side (Ivanov 2017, 2018b; Garvey et al., 2015). Concurring to a later overview (Gatepoint Inquire about, 2012), real-world supply chain disturbances begin nearly similarly between the request side and tier-one providers. In this ponder, we consider a single arbitrary disturbance that impacts one or more hubs within the organization. This disturbance can be caused by any sort of chance, counting a common calamity, provider disappointment, spontaneous request, or political and financial precariousness, and the seriousness of the disturbance is measured by the number of hubs that it at first impacts. To confine the impacts of one disturbance from another, we expect that there are no other major disturbances happening in a given perception period. Present-day supply chains have ended up much more complex comprising a wide and complex organize of interconnected units, counting not only as it were providers, producers, wholesalers, retailers and clients but it moreover incorporating supplier's providers, customer's clients, etc. Since of this expanded complexity, numerous

creators have recommended that they are superior and portrayed as supply systems (Surana et al., 2005). Besides, the idea of a complex organize has been put forward to depict the plan and investigation stage of the supply chain (Choi et al., 2001; Pathak et al., 2007;) (Sonia Irshad Mari, 2015)

2.1.3 Big Data Analytics Capability

With tall levels of natural vulnerability, it is crucial for organizations to receive and create forms utilizing huge information over vehement capabilities to realize supply chain maintainability execution (Janssen et al., 2017). Key capabilities characterize the maintainable existence of an organization. Braganza et al. (2017) proposed a trade handle design for executing enormous information (BD) ventures and argued that BD programs ought to go past one-off activities to get an energetic capability. Gunasekaran et al. (2017) conducted a consider that utilized the resource-based see to clarify how assets (particularly related to data sharing and consequent network) affected the capability of BD absorption. Generally, the firm-level performance and supply chain execution are decided by imaginative green item improvement, which is advanced subordinate to senior administration bolster's intercession impact. The energetic changes in innovation strengthen organizations to implement vital thought of worker ability and capabilities. The association of a tall volume of information in nearly every circle of con- brief organizations increases the trouble of representative curettement (Shah et al., 2017). Tiwari et al. (2018) checked six long times of inquiries about exploring BDA applications in supply chain administration over key sourcing and acquirement through request arranging and coordination exercises. Such a breadth of applications has too been distinguished, with the good thing about BDA, which is specifically for arranging purposes, but frequently requires specialized staff aptitudes (Wood et al., 2017). Without development, it isn't conceivable for any organization to attain a competitive edge, and the victory of supply chain forms depends on advancement (Hult et al., 2004). Supply chain innovativeness bolsters unused items and handles advancements, emphasizing a fast reaction to client prerequisites (Azadegan and Dooley, 2010). BDA absorption and routinization underpin higher levels of the

supply chain and organizational execution (Surajit Baga, 2020). To begin with, the method challenges relating to information administration forms, especially those relating to securing and putting away information and information mining and required cleansing exercises. Moment, the administration challenges such as overseeing security, the security of information, administration of information, how the data sharing happened and was overseen, and possession of the information. A high level of innovativeness is required to realize benefits from advances. Creating last items and administrations without the element of supply chain innovativeness isn't doable (Hult et al., 2004; Wang et al., 2015; Surajit Baga, 2020) Enormous information brings with it the potential to move forward item estimates and provide curious bits of knowledge into client behaviours. Be that as it may, these potential benefits come with enormous viable challenges for request organizers. To begin with, the sheer volume of information can be overpowering. For illustration, Walmart collects more than 2.5 petabytes (1 petabyte = 1 million gigabytes) of information each hour from one million customer transactions.¹⁰ Be that as it may, as it were approximately 0.5% of all information collected is analyzed.¹¹ In this way, a viable address is, what information ought to be put away, and for how long? Second, Feng, and Shanthikumar (2018) point out that, whereas "theoretically more data leads to superior figures, the challenge, in any case, comes from managing with the expanded number of factors and their vague relationships." (Tonya Boone, 2018)

Enormous information requires much more than the application of modern analytics (El-Kassar and Singh, 2018) as firms that learn to take advantage of enormous information unbridled unused organizational capacities and esteem (Davenport et al., 2012). It is additionally related to note that corporate commitment to the utilization of enormous information analytics is exceptionally critical as past writing proposes that the corporate commitment influences huge information digestion through acceptance and routinization courses (Singh and El-Kassar, 2019) which in turn to upgrade feasible execution of the firms (Coluccia et al., 2019). A few colleagues moreover propose that for firms to have predominant execution from their representatives, they ought to use analytics over the intestine instinctual

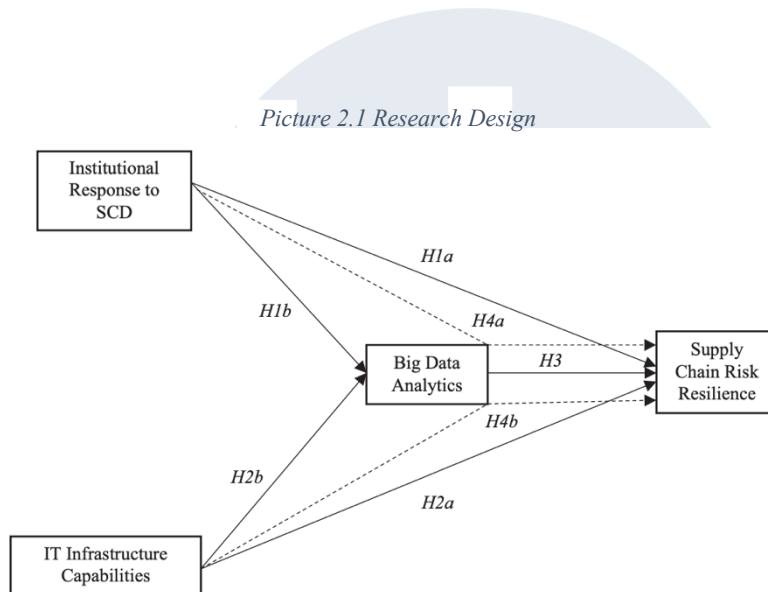
(Del Giudice et al., 2018; Davenport et al., 2010) which calls for an information-driven decision-making culture (Santoro et al., 2019; Soto-Acosta et al., 2018; McAfee et al., 2012). The extant writing recommends a few illustrations of enormous information activities and treating it as firm's energetic capabilities that offer assistance make commerce important information, to include esteem, upgrade execution and grant competitive advantage to the firms over their rivals within the energetic advertise, still beat supervisors are obviously hesitant to frequently distribute assets to encourage huge information analytics (El-Kassar and Singh, 2018) for maintainable improvement of individuals, prepare, and organization (Budhwar et al., 2018; Singh, 2018; Al-Ali et al., 2017). Given these contrasts, huge information administration poses a few significant challenges to organizations. To utilize this data, they must create “big information architectures,” which are systems composed of a few processors, machines, and databases that can collect, prepare, store, and analyze huge information (Yi et al., 2014). Such designs have to be based on information lakes, which are frameworks or stores of information put away in their unique arrange. An information lake is as a rule a single store of all enterprise information counting crude duplicates of source framework information and trans-shaped information, inferred from sensors observing machines or inside handles (Gupta and Giri, 2018).

Enormous information contrasts from conventional datasets such as those in Exceed expectations records in at least seven ways:

volume, speed, assortment, veracity, esteem, inconstancy, and visualization. Hence, the term “big data” has frequently been utilized to portray datasets that are both expansive and complex and cannot be analyzed with conventional measurable models (Manyika et al., 2011). The components of BDA foundations share the same hypothetical establishment as any other administration data framework. BDA infrastructures are crucial for decision-making, for the coordination, control, and investigation of forms, and for the visualization of in-arrangement (Riccardo Rialtia, 2019).

2.2 Research Design

Working on this dissertation, the researcher adopting the research model that refers to research that has been done by Nitya Prasad Signh (2019) on their journal named “*Building Supply Chain Risk Role of big data analytics in supply chain disruption mitigation*” so the research method will be:



Source: Nitya prasad Signh (2019)

The hypothesis that will be tested in this research is based on the research method in Figure 2.1, namely:

1. H1a: Institutional response to supply chain disruption events (ISCD) positively impacts firm capability to develop supply chain risk resilience (RiskRes).
H1b: Institutional response to supply chain disruption events (ISCD) positively impacts BDA capabilities within a firm.
2. H2a: ITIC positively impacts the development of BDA capacity within a firm.
H2b: ITIC positively impacts the development of supply chain risk resilience (RiskRes) capacity within a firm.

3. H3: BDA positively impacts development of supply chain risk resilience (RiskRes) capability within organizations.
4. H4a: The relationship between institutional response to supply chain disruption events (ISCD) and supply chain risk resilience (RiskRes) is positively mediated by BDA capabilities.
H4b: The relationship between ITIC and supply chain risk resilience (RiskRes) is positively mediated by BDA capabilities.

2.3 Hypotheses

2.3.1 Institutional response to supply chain disruption events (ISCD) positively impacts firm capability to develop supply chain risk resilience (RiskRes)

A firm that's able to reconfigure and reorganize its asset base (Sirmon et al., 2007; Eddleston et al., 2008) in an energetic environment, may have distant better a much better, higher, stronger, and stronger chance of creating capabilities to diminish the effect of disturbance occasions (Craighead et al., 2007; Scheibe and Blackhurst, 2018; Sighn 2019) Supply chain disruptions are a constant threat, impacting various aspects of a company's operations and financial health. These disruptions have a cascading effect, potentially leading to production slowdowns, inventory shortages, and ultimately, eroded profits. To navigate this challenging landscape, companies must proactively develop capabilities for dealing with both current and anticipated disruptions. This proactive approach is crucial for mitigating the negative impacts and ensuring long-term sustainability. Developing robust supply chain resilience is at the heart of navigating a world prone to disruptions. This involves fostering various capabilities, such as diversifying supplier bases, adopting flexible production methods, and investing in advanced technologies. By embracing these capabilities, companies can build adaptable and resilient supply chains that can absorb and weather disruptions, minimizing their impact on overall performance.

This allows companies to maintain operational efficiency, protect profit margins, and ultimately, achieve continued success in an ever-evolving global environment.

This perspective was advanced and amplified by researchers who contend that supply chain strength is the capacity of the supply chain to outlive, adjust, and develop in confront of turbulent alter (Chopra and Sodhi, 2014; Dubey, Gunasekaran, Childe, Fosso Wamba, Roubaud and Foropon, 2019). In this manner, from an organizational point of view, creating the capability to oversee dangers radiating from supply chain disturbance occasions can be a source of competitive advantage (Gualandris and Kalchschmidt, 2015). A central contention over these areas is that separation hinders the capacity of firms to share data, collaborate, arrange, and learn. Without a doubt, within the administration writing, geographic removal has appeared to matter over a broad cluster of firm choices and settings, counting provider determination (Schmitt and Van Biesebroeck, 2013), R&D union arrangement (Reuer and Lahiri, 2014), procurement action (Chakrabarti and Mitchell, 2016) and the probability of wander capital venture (Sorenson and Stuart, 2001; Lawson *et al.*, 2018).

H1a: Institutional response to supply chain disruption events (ISCD) positively impacts firm capability to develop supply chain risk resilience (RiskRes).

2.3.2 Institutional response to supply chain disruption events (ISCD) positively impacts BDA capabilities within a firm.

Learning from Disruptions, how Firms Build Resilience Through Institutional Responses As businesses navigate the ever-present threat of institutional risks, they develop adaptive responses to commonly encountered disruptions. These responses, honed through experience, become institutionalized practices within the organization, serving as a

valuable resource for handling future disruptions. This dynamic interplay between external pressures and internal learning shapes managerial decision-making under risk. Decision-makers consider not only the immediate challenge but also the institutional memory built from past disruptions. This memory, a repository of past responses and their effectiveness, allows for a more informed approach to future threats. Over time, institutions codify these responses as formal procedures and best practices. These codified responses are then viewed as the firm's in-house resilience capabilities for mitigating supply chain disruptions. Furthermore, experiencing a disruption event itself catalyses capability development. Firms exposed to disruptions actively seek to enhance their institutional capabilities to manage future disruptions more effectively. This proactive approach emphasizes continuous learning and improvement, ensuring the organization remains adaptable and resilient in the face of evolving challenges. In essence, institutional responses to disruptions become a cornerstone of a firm's resilience strategy. By learning from past experiences and adapting their internal practices, firms can build robust capabilities that not only weather immediate disruptions but also ensure long-term sustainability and success in a risk-laden environment. These capabilities are created by centering on techniques that point to decrease the negative affect of disturbance occasions (Craighead et al., 2007; Scheibe and Blackhurst, 2018; Sighn 2019) to this date, as it were a restricted number of ponders have investigated the ways in which

Organizations can moderate the affect of SCDs caused by financial disturbance, widespread, and startling climate mitigations (Butt 2021; Dohale et al. 2021; El Baz and Ruel 2021; Mahajan & Tomar 2021). A robust and adaptable supply chain is critical for an organization's ability to handle disruptions (Weber, 2021). Ecological resilience refers to the ability of an organism, or in a business context, an organization, to adapt and persist in the face of disruptions by transitioning to a new, stable state (Adobor, 2019). This concept differs from engineering resilience, which focuses on a

system's resistance to disruptions and its speed of returning to its original equilibrium. In contrast, ecological resilience emphasizes the magnitude of disruption a system can absorb before undergoing a fundamental structural change (Wieland, 2021).

H1b: Institutional response to supply chain disruption events (ISCD) positively impacts BDA capabilities within a firm.

2.3.3 ITIC positively impacts the development of BDA capacity within a firm.

Numerous worker characteristics could be imperative in this respect, counting individuals' abilities and capacities, cognitions, influence, behaviours, and self-regulatory forms. Cases incorporate intelligence, self-efficacy, enthusiastic solidness, openness to involvement, social back, feeling acknowledgment, self-discipline, genius, and cognitive flexibility (vanderVegt, 2016). Big data exploitation offers a multitude of advantages across various organizational functions. Studies have shown positive impacts in areas such as customer relationship management (Kiron et al., 2013; Wamba et al., 2017a, 2017b; Bertello et al., 2020), operational risk management (Germann et al., 2014), and overall firm performance and operational efficiency (Bresciani et al., 2018; Mikalef et al., 2019b). This vast amount of detailed information empowers managers to make more informed decisions regarding various business processes (Bresciani et al., 2018; Dubey et al., 2018). By leveraging big data analytics (BDA), managers gain insights into the state of the supply chain, workforce performance, internal operations, and even consumer behavioral patterns, allowing for more strategic decision-making across the organization (Kiron et al., 2013; Wamba et al., 2017a, 2017b). The rise of the Internet of Things (IoT) will generate massive amounts of data at the network edge (sensors, devices, etc.). Distributed and edge computing infrastructure will be crucial

to process and analyze this data efficiently, enabling real-time insights and near-instant decision-making. Infrastructure automation using tools like Infrastructure as Code (IaC) will further streamline BDA processes. This allows for faster deployment, configuration management, and scaling of infrastructure resources, ultimately enabling faster and more efficient BDA initiatives the volume and sensitivity of data continue to rise, strong infrastructure becomes even more critical for data security and governance. Robust security measures ensure data integrity and protection from cyberattacks, while effective data governance frameworks ensure responsible data collection, storage, and usage. This focus on security and governance fosters trust in BDA initiatives and allows firms to leverage their data ethically and productively. Here's a paraphrase of the sentence, an organization's IT resources can be broadly categorized into two main types. Technological IT resources include the physical components that make up the IT infrastructure, such as servers, computers, software, and communication networks. On the other hand, managerial IT resources refer to the skills and expertise possessed by IT managers. These skills can be categorized as both business acumen and technical proficiency (Ajamieh et al., 2016). This too empowers organizations to customize their item offerings (Raguseo and Vitari, 2018), as well as offer assistance make strides in straightforwardness and responsibility (Matthias et al., 2017).

H2a: ITIC positively impacts the development of BDA capacity within a firm.

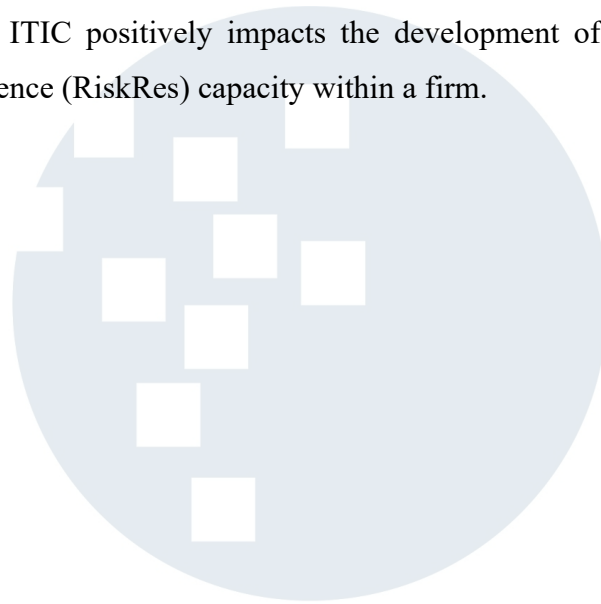
2.3.4 ITIC positively impacts the development of supply chain risk resilience (RiskRes) capacity within a firm.

Supply Chain Versatility was at first named as the capability to upgrade a supply chain's chance to bounce back when confronted with disturbance (Nikookar & Yanadori, 2021) and is accepted to have been borrowed from

the field of mechanical designing. Concurring to (Ming, Omain, & Kowang, 2021), flexibility is a multidisciplinary concept developed from fabric science; it portrays the characteristics of a fabric returning to its unique shape after experiencing distortion. A supply chain comprises the firm, the providers, shoppers, and other locked-in parties in its running. Inside the advanced social-ecological range, Supply Chain Flexibility is seen as the characteristic that brings around efficient alteration, adjustment, reorganization, and disturbance taking care of (Jones et al. 2014). An effective BDA framework can also have a positive effect on internationalization forms. As pointed out by Gnizy (2018), enlightening forms are the portion of the exploratory capacity of those firms that will compete globally, since exporters having significant data would be more likely to consider openings from remote markets. Modern IT infrastructure facilitates real-time data visibility across the entire supply chain network. This includes everything from inventory levels and transportation schedules to potential bottlenecks and supplier performance. This level of transparency allows for early detection of disruptions, enabling proactive mitigation strategies and faster response times when disruptions occur. By analyzing vast amounts of data from various sources, organizations can identify potential disruptions ahead of time, optimize resource allocation, and predict bottlenecks. ITIC hence may be a DC inside an organization that empowers the firm distinguish dangers from the inside and outside environment (Wang et al., 2015), survey the affect of the chance on organizational supply chain, create hazard treatment medicines (Tan et al., 2015) and screen and audit the adequacy of hazard moderation methodologies inside the supply chain (Ajamieh et al., 2016). Advanced AI and Machine Learning algorithms will play a crucial role in predictive analytics, risk identification, and automated decision-making, further enhancing SCRR capabilities. ITIC will need to be increasingly scalable and adaptable to accommodate the rapidly evolving nature of global supply chains and the ever-present threat of disruptions. ITIC is not merely a

supporting element; it's a critical driver for building a robust and adaptable supply chain equipped to navigate the complexities of the modern world. By investing in modern IT infrastructure and leveraging its capabilities, businesses can significantly enhance their SCRR and ensure long-term sustainability and success in the face of unforeseen challenges.

H2b: ITIC positively impacts the development of supply chain risk resilience (RiskRes) capacity within a firm.



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2.3.5 BDA positively impacts development of supply chain risk resilience (RiskRes) capability within organizations.

BDA is characterized as a “holistic approach to overseeing, preparing, and

analyzing the 5 V data-related measurements (i.e., volume, variety, velocity, veracity and value) to form significant bits of knowledge for conveying supported esteem, measuring execution and setting up competitive advantages” (Wamba et al.2017a). BDA is getting to be a beat drift within the talk about of both scholastics and specialists (Tian 2017) due to the competitive advantage it can bring to companies by not as it were giving designs examination but moreover the prescient probability of an occasion (Gandomi and Haider 2015; George et al. 2016). The opportunity to perform a novel, adaptable, and energetic information investigation has driven the inquire about stream on BDA to create rapidly (George et al. 2016). Be that as it may, as firms accumulate information from their commerce environment one region where BDA especially contributes to firm victory is in creating trade hazard flexibility from supply chain disturbance occasions (Wamba et al., 2017). BDA capabilities inside an organization empower it to gather, mine, analyze and visualize information successfully, empowering choice producers to create significant insights for choice-making (Davenport et al., 2010; Sharma et al., 2014; Sighn 2019). Based on the inquiry about by (Ajayi et al. 2019), in the connection between the Big Data stage and security mishap expectations was evaluated. This paper comes about appears that a critical change was made in data administration. Big Data Analytics (BDA) is emerging as a game-changer in the realm of supply chain risk resilience (SCRR).

The ability to harness the power of vast datasets offers organizations a unique opportunity to not only weather disruptions but also proactively

build a more resilient supply chain. At the heart of this positive impact lies BDA's potential for unveiling hidden patterns and trends. By analyzing mountains of data, from historical records to real-time sensor readings and social media sentiment, businesses can gain a predictive edge. This foresight allows for the identification of potential disruptions before they occur, enabling proactive mitigation strategies to be implemented. Imagine being able to anticipate weather-related delays or supplier performance issues and adjust transportation routes or source materials accordingly. Huge information analytics and machine learning strategies came to the closer view as enablers of esteem creation from enormous information, advertising modern competitive preferences to companies (Chen et al. 2012). They have expanded SC information permeability and information straightforwardness and can decrease data disturbance dangers and behavioural instability as well as request dangers through consistency (Baryannis et al. 2019a, b; Brintrup et al. 2019); all of which are emphatically connected to SC strength. The positive impact of BDA extends beyond mere planning and prediction. BDA fosters real-time visibility across the entire supply chain network. This transparency allows for the early detection of disruptions and facilitates a coordinated response from various stakeholders within the ecosystem. Imagine a scenario where a sudden surge in demand can be quickly communicated across the supply chain, allowing for adjustments in production schedules and distribution plans to minimize disruptions.

H3: BDA positively impacts development of supply chain risk resilience (RiskRes) capability within organizations.

2.3.6 The relationship between institutional response to supply chain disruption events (ISCD) and supply chain risk resilience (RiskRes) is positively mediated by BDA capabilities.

The way institutions respond to disruptions in the supply chain can have a significant impact on an organization's overall risk resilience. This relationship, however, isn't always a direct one. Big Data Analytics (BDA) capabilities act as a crucial mediator, amplifying the positive effects of institutional responses on an organization's ability to weather future disruptions. Taking after a substance examination of specific papers on SC disturbances, future headings have been recognized which we trust will rouse unused researchers to set up their investigative motivation in this field (K. Katsaliaki, 2020). The defencelessness of people cannot be ascribed exclusively to the event of more strongly physical occasions. Social, financial, and political circumstances impact vulnerabilities. Consequently, characteristic calamities are more precisely depicted as “seminatural” (Schneiderbauer & Ehrlich, 2004), as moderate or sudden forms that happen at the crossing point of nature and society, coming about from the interaction between a dangerous specialist (such as a tropical storm, torrent, tropical storm, or surge) and the socio-cultural and natural setting on which it has an impact (Oliver-Smith, 2013). Solid and dependable models are required to utilize BDA to figure out diverse circumstances. In truth, prescient analytics capabilities have a noteworthy impact on the natural, social, and financial execution of the supply chain (Jeble and Dubey, 2017). BDA might have insufficiencies. In a case considered within the keeping money segment, it appeared that a few arrangements in terms of quality control and data gathering methods have to be altered ceaselessly. It was demonstrated that measurable investigation should be conducted on the most current collected information in arrange to get the most excellent and timeliest data from the past (Sajjad Shokouhyar, 2019). This is where BDA

capabilities come into play. By leveraging data analytics tools, companies can extract valuable insights from institutional responses. They can analyze trends, identify opportunities presented by new regulations, or optimize resource allocation based on support programs offered. Essentially, BDA capabilities allow businesses to interpret and translate the broader institutional response into concrete actions that strengthen their own risk management practices.

H4a: The relationship between institutional response to supply chain disruption events (ISCD) and supply chain risk resilience (RiskRes) is positively mediated by BDA capabilities.

2.3.7 The relationship between ITIC and supply chain risk resilience (RiskRes) is positively mediated by BDA capabilities.

Supply Chain Resilience (SCR) traditionally focuses on a firm's reactive responsiveness and recovery ability during disruptions within an unstable business environment. This resilience encompasses the entire supply chain network, including the firm itself, its suppliers, consumers, and other collaborating parties. However, in the modern social-ecological context, SCR goes beyond mere reactive measures. It's seen as a characteristic that fosters systemic change, adaptation, reorganization, and proactive disruption handling. (Bakshi & Kleindorfer, 2009). In my strong opinion, strong ITIC serves as the foundation for a resilient supply chain. Robust infrastructure, including reliable servers, secure networks, and advanced communication platforms, enables real-time data visibility across the entire supply chain network. This includes everything from inventory levels and transportation schedules to supplier performance and potential bottlenecks. With this level of transparency, organizations can identify potential risks before they escalate into major disruptions. Hence made strides supply chain perceivability capability diminishes both the likelihood

and effect of supply chain disturbance, as well as leads to improved supply chain hazard resilience” (Dubey, Gunasekaran, Childe, Fosso Wamba, Roubaud and Foropon, 2019, p. 5). ITIC is the essential platform that allows for the collection and analysis of data. But it's BDA capabilities that truly transform this data into actionable insights. This synergy between ITIC and BDA empowers organizations to move beyond reactive responses and build a proactive and adaptable supply chain, ultimately leading to enhanced risk resilience. To effectively utilize BDA, there needs to be some awareness of its underlying infrastructure, the analytical methods it uses, how it might impact existing workflows, and the potential benefits it can bring (Côte-Real et al. 2017; Rialti et al. 2019a). Building a truly resilient supply chain goes beyond simply reacting to disruptions. It's about proactive preparation and the ability to adapt and evolve in the face of unforeseen challenges. Here's where ITIC play a critical role, and their impact is further amplified by BDA capabilities. These capabilities are either due to organizational learning from earlier disturbance occasions, or the nearness of ITICs. Hence, we encourage propose that BDA capabilities complement the existing chance relief forms, and emphatically intervene the affect of ISCD and ITIC, driving to supply chain hazard strength inside firms (Singh, 2019).

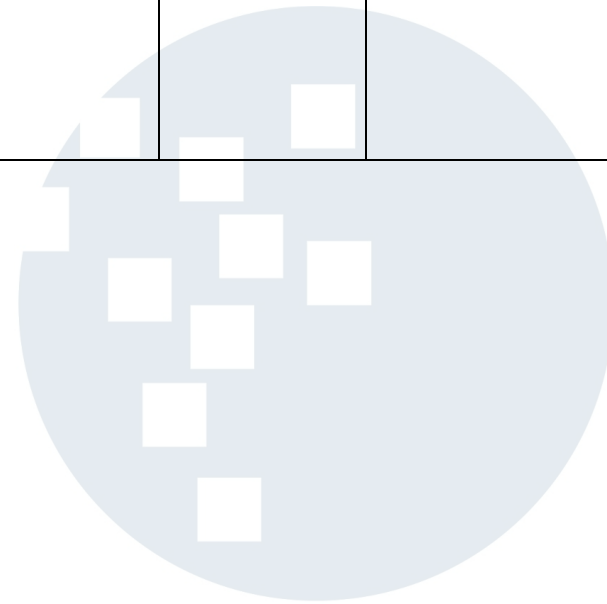
H4b: The relationship between ITIC and supply chain risk resilience (RiskRes) is positively mediated by BDA capabilities.

2.4 Earlier Research

No.	Researchers Name	Publications	Research Title	Research Gap
1.	Nitya Prasad Singh (2019)	(jurnal, volume, nomor)	Building supply chain risk resilience	This research which I use as my main journal to work

			Role of big data analytics in supply chain disruption mitigation	on my research, this research is primarily working on US and Europe area. Which my research is revolving around Asia.
2.	Rameshwar Dubey, Angappa Gunasekaran, Stephen J. Childe, David J. Bryde, Mihalis Giannakis, Cyril Foropon, David Roubaud, Benjamin T. Hazen (2019)	Elsevier B.V.	Big data analytics and artificial intelligence pathway to operational performance under the effects of entrepreneurial orientation and environmental dynamism: A study of manufacturing organisations	This journal uses entrepreneurial orientation (EO) as its object for the research, although mine uses Supply chain risk resilience.
3.	Jury Gualandris Matteo Kalchschmidt (2015)	Emerald	Supply risk management and competitive advantage: a misfit model	Journal that created by Gualandris and Kalchschmidt is populated by

				<p>Italian respondend, so there will be different in mitigations, and approach to journal that I write.</p>
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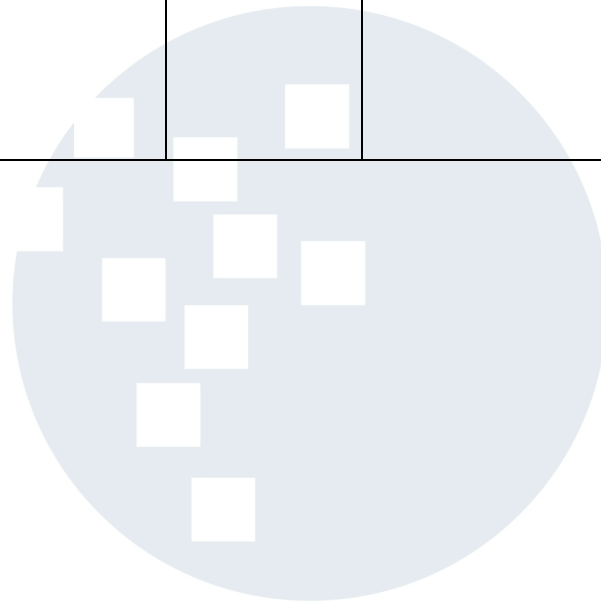


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4.	Kanika Mahajan ,Shekhar Tomar (2020)	Wiley Online Library	COVID-19 and Supply Chain Disruption: Evidence from Food Markets in India	K. Mahajan, and S. Tomar is already on point about what is the disruptions and where the disruptions is happening, which mine is talking broader area about the supply chain disruption.
5.	Reza Lotfi, Bahareh Kargar, Seyed Hosein Hoseini, Soroush Safavi, Gerhard- Wilhelm Weber, Sima Nazari (2021)	Wiley Online Library	Resilience and sustainable supply chain network design by considering renewable energy	The journal is working on the network design on renewable energy only, so they focused the discussion to renewable energy.
6.	Adobor, H. (2019)	Taylor and Francis Online	Supply chain resilience: A multi-level framework	Adobor's journal is using different method of study with the journal I'm working right

				<p>now. They study multi-level SCRES whilst mine is studying about the SCRES in all levels of management.</p>
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7.	Alberto Bertello, Alberto Ferraris, Stefano Bresciani, Paola De Bernardi (2020).	Springer Link	Big data analytics (BDA) and degree of internationalization: the interplay between governance of BDA infrastructure and BDA capabilities	This Journal created to focused on talking about the internalization of BDA between BDA of governance and BDA capabilities.
8.	Wamba, S. F., Gunasekaran, A., Aker, S., Ren, S. J., Dubey, R., & Childe, S. J. (2017).	Elsevier	Big data analytics and firm performance: Effects of dynamic capabilities.	This journal used a different approach to work on this research with my research, Process- oriented dynamic capabilities and evaluate the mediation effect on the relationship.
9.	Bresciani, S., Ferraris, A., Del Giudice, M., (2018).	Elsevier	The management of organizational ambidexterity through alliances in	Bresciani journal were studying about the

			a new context of analysis: Internet of Things (IoT) smart city projects	ambidexterity in IoT, I took the ambidexterity of IoT to combined it with BDA and SC RiskRes.
10.	Nikookar, E., Yanadori, Y. (2021).	Emerald	Preparing supply chain for the next disruption beyond COVID-19: Managerial antecedents of supply chain resilience	Forecasting and prepare for any disruptions that could happened in the future after COVID-19 Pandemic, build a resilience supply chain with BDA.
11.	Ming, L.Y., Omain, S.Z.B., Kowang, T.O. (2021).	HRMARS	Supply Chain Resilience: A Review and Research Direction	This journal helps me on predicting what's the directions on to the next few years on supply chain resilience.

12.	Ajamieh, A., Benitez, J., Braojos, J. and Gelhard, C. (2016)	Elsevier	IT infrastructure and competitive aggressiveness in explaining and predicting performance	This study is only directed to large firms in Spain, and it has been more than 5 years so needed to renew the validity of this journal even though there are some still related until this era.
13.	Ajayi, A., Oyedele, L., Delgado, J., Akanbi, L., Bilal, M., Akinade, O. and Olawale, O. (2019)	Emerald Insight	“Big data platform for health and safety accident prediction”, World Journal of Science, Technology and Sustainable Development”	The research object is using health and safety accident prediction, which is different than mine that talking about supply chain disruptions.
14.	Brintrup, A., Pak, J., Ratney, D., Pearce, T., Wichmann, P.,	Research Gate	Supply chain data analytics for predicting	This research utilising their case study by

	Woodall, P., et al. (2019).		supplier disruptions: a case study in complex asset manufacturing. International Journal of Production Research.	using data from the ERP and estimating likelihood the delivery time is going to be delayed or not.
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15.	Riccardo Rialti, Lamberto Zollo, Alberto Ferraris, Ilan Alon. (2019)	Elsevier	Big data analytics capabilities and performance: Evidence from a moderated multi-mediation model	This Research uses only data from Managers in European Union, despite that the object also different than my dissertation.
16.	K. Katsaliaki P. Galetsi S. Kumar. (2020)	Research Gate	Supply chain disruptions and resilience: a major review and future research agenda	This research using explicit methods and adapting bibliometric technique to identify and analyze the results.
17.	Sajjad Shokouhyar, Mohammad Reza Seddigh, Farhad Panahifar. (2020)	Emerald Insight	Impact of big data analytics capabilities on supply chain sustainability	The research questionnaire held around Iran pharmacist and applicable geographically only in Iran.
18.	Jeble, S. and Dubey, R. (2017)	Emerald Insight	Impact of big data and predictive analytics	This research is meant to predict and analyze the

			<p>capability on supply chain sustainability”, The International Journal of Logistics Management, Vol. 29 No. 2, pp. 513-538</p>	<p>capability of sustainability in supply chain.</p>
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19.	Bakshi, N.; Kleindorfer, P. (2009)	Sage Journal	Co-opetition and Investment for Supply- Chain Resilience	Since this journal been ages way from 2024, it talks about the starting of investment for creating and developing the first generation of Supply chain resilience network.
20.	Dubey, R., Gunasekaran, A., Childe, S.J., Fosso Wamba, S., Roubaud, D. and Foropon, C. (2019)	Taylor and Francis online	“Empirical investigation of data analytics capability and organizational flexibility as complements to supply chain resilience”	The gap is about geographical issues whereas the research is held and meant for Indian Manufacturing Organizations.

Table 2.1 Earlier Research