LITERATURE REVIEW

2.1 Introduction

This chapter presents the theoretical foundation of the research. First, it outlines logistics and supply chain resilience to highlight the importance of preparedness in withstanding disruptions. Next, studies on operating efficiency, competitive advantage, and innovations in the service sector are reviewed to understand the current literature. Then, customer satisfaction literature is examined to capture the perspective of courier users. Studies on various weighing and aggregation methods are explained. Finally, research gaps are identified to formulate the research questions for the study. A detailed review of relevant literature is presented throughout the chapter.

2.2 Literature on logistics and supply chain resilience

Supply chain (SC) resilience has received significant interest from both practitioners and scholars, primarily concentrating on the obstacles and long-term consequences highlighted during the pandemic (Sharma et al., 2021; Garola et al., 2023). In the current volatile economic landscape, establishing a robust supply chain is a paramount concern for enterprises (Ivanov, 2022). Organizational resilience, characterized as the ability to manage significant problems and adjust after unforeseen, irregular occurrences, has emerged as a crucial priority (Zighan et al., 2021; Dwaikat et al., 2022). The notion of supply chain (SC) resilience is the capacity to foresee, plan for, react to, and recuperate from interruptions. SC resilience, defined by the capacity to anticipate, adjust to, and rapidly recuperate from disturbances, is essential for ensuring continuity in service delivery (Ivanov and Dolgui, 2020). The 4Rs, which include retooling, repurposing, recalibrating, and reconfiguration, further define this resilience (Dwaikat et al., 2022). Literature identifies five primary action stages of resilience: preparation, prevention, protection, response, and recovery (Thoma et al., 2016; Ketudat & Jeenanunta, 2021). Unforeseen occurrences, ranging from severe weather and product contamination, can

readily interrupt enterprises in the current complex global economy. Lin et al. (2023) delineated three distinct pathways to resilience development: stabilization, which emphasizes returning to the original normal; adaptation, which entails evolutionary modifications toward a new normal; and transformation, which encompasses revolutionary changes aimed at achieving a new normal plus. Furthermore, Lin et al. (2023) identified three strategic orientations operating across these pathways: people orientation, digital orientation, and learning orientation. Three resilience capabilities serve a specific function: absorptive capability before disruption, reaction capability during disruption, and recovery capability after disruption, each of which influences supply chain performance in a unique way (Zhao et al., 2023).

Research reveals a complex relationship between an organization's sustainability and the resilience of its supply chain (Ambulkar et al., 2015). Logistics service providers (LSPs) are essential contributors to these networks, significantly enhancing resilience. Their ability to endure shocks significantly impacts the resilience of the entire supply chain (Sharma et al., 2021). The significance of LSPs has escalated in recent years, especially because of the rising incidence of disruptions caused by natural catastrophes, economic instability, and global health emergencies. LSPs serve as essential middlemen, facilitating the movement of commodities via transportation, warehousing, distribution, and comprehensive supply chain solutions (Christopher & Holweg, 2011). Carvalho et al. (2012) identify attributes for resilience—flexibility, adaptability, and collaborative synergies—as crucial during periods of disturbance. LSPs must leverage their innovation capabilities to implement resilience components either concurrently or consecutively to successfully address these concerns (Dovbischuk, 2022). Cortes and Suzuki (2021) asserted that delivery efficiency is a critical aspect of last-mile delivery for parcel delivery businesses and proposed a decision-making tool to enhance operational efficiency. Zhao et al. (2023) indicated that digitalization affects resilience capabilities variably through diverse resource and structural modifications. Flexibility is a crucial quality for LSPs, allowing for the rapid recalibration of operations, including the rerouting of shipments and the adjustment of warehouse capacities, in reaction to real-time disturbances (Sheffi and Rice, 2005). Integration in SC emphasizes consistent, high-quality service delivery, customer satisfaction, and value creation, covering all aspects of logistics, including transportation, warehousing, and customer contacts (Liu & Lee, 2018). Recent studies link adaptability to enhanced resource allocation and proactive contingency planning, which

are crucial for sustaining continuity during disturbances (Pettit et al., 2010; Queiroz *et al*., 2022). The research indicated that reconfiguration capability markedly affects supply chain resilience, as COVID-19 necessitated firms to reallocate resources to more effectively meet demand, with upstream disruptions eliciting responses to market threats and opportunities, while downstream disruptions improved reconfiguration abilities (Aumbulkar et al., 2015; Kähkönen et al., 2023). Logistics innovation capability has demonstrated its significance as LSPs increasingly engage with partners in cooperative contingency planning to maintain operations during emergencies (Wang *et al*., 2020). There is a need to include local stakeholders to enhance personalized services via dynamic collaborations throughout the supply chain, presenting the concept of Last-Mile-as-a-Service (LMaaS) (Correia et al., 2021). Technological breakthroughs, such as the internet of things, artificial intelligence, and blockchain, have improved logistics service providers' capacity to predict and address disruptions with more accuracy, hence enhancing operational continuity and customer satisfaction (Ivanov et al., 2017; Dovbischuk, 2022). Attaining elevated operational efficiency is essential, as it diminishes lead times, enhances order precision, and saves expenses (Mentzer et al., 2001). Optimized route planning and load maximizing in transportation conserve fuel and decrease delivery times, yielding substantial advantages for logistics service providers and their clients (Zhou et al., 2020). Notwithstanding these developments, LSPs continue to encounter significant challenges in handling disruptions, such as elevated operational expenses, disjointed technology integration, and restricted cross-supply-chain collaboration (Hohenstein et al., 2015). Ongoing research emphasizes the importance of bolstering resilience to maintain service continuity and respond to the dynamic requirements of the global SC environment. Studies (Raj et al., 2024) identify insufficient visibility, low efficiency, and unpredictable factors as the primary risk challenges for last-mile logistics practices. Dovbischuk (2022) underscored the importance of dynamic resilience, pointing out that disruptions like COVID-19, which impact many stages of the SC across various nations and industries simultaneously, tend to be more intricate and enduring than those resulting from natural catastrophes or anthropogenic crises. Recent studies underscore the pandemic's effect on consumer behavior and purchase patterns and highlight the need for research on LSP resilience (German et al. 2022). Studies also investigate adaptive strategies, such as mobile warehousing for last-mile delivery (Srinivas & Marathe, 2021), and advocate for collaborations aimed at achieving environmental objectives (Viu-Roig & Alvarez-Palau,

2020), with certain researchers observing that sustainable practices might offer a competitive advantage to firms affected by the pandemic (Sarkis, 2021).

The majority of research has focused on LSPs' resilience (Table 2.1) that provide integrated services such as warehousing, shipment management, and transportation. However, when the concept is narrowed down to courier, express, and parcel (CEP) service providers, LSPs manage only transportation; they uncover distinct issues, particularly in competitive environments where cost and time are crucial (Mangiaracina et al., 2019; Garola et al., 2023). Therefore, this emphasizes a study need in comprehending how CEPs navigate disruptive occurrences and cultivate resilience. Disruptions present a distinctive chance to examine how LSPs react to low-probability, high-impact occurrences, highlighting the necessity for additional research in this domain (Choi, 2021; Herold et al., 2024).

Table 2.1 Literature on measuring the resilience of logistics service providers

Authors	Country	Objectives	Techniques to measure resilience	Comparison among service providers	Findings
Herold et al., 2021	Austria	To study the impact of COVID-19 and lessons learned from LSPs on SC resilience	Qualitative	No	This study presented a resilience paradigm to examine LSPs' reactions to COVID-19 disruptions, highlighting five principal themes: revenue generation, operational flexibility, digitalization, infrastructure optimization, and personnel management. Findings reveal that only larger LSPs succeeded in generating additional revenue, for e.g., the acquisition of aircraft for PPE transport, while similar tactics were observed in the management of logistics and personnel across LSPs.
Ketudat and Jeenanunta, 2021	Thailand	To study the impact of the COVID-19 pandemic on logistics firms and their resilience	Qualitative: Thematic analysis	No	The investigation highlighted five essential variables that enhance the resilience of logistics firms: flexibility, business continuity planning (BCP), market diversification, solid IT systems, and effective leadership. These elements facilitated rapid adaptation and recovery for companies during the epidemic. Businesses having a BCP show superior capabilities in managing interruptions, exhibiting expedited recovery and preparedness for post-pandemic operations.

Authors	Country	Objectives	Techniques to measure resilience	Comparison among service providers	Findings
Hirata and Matsuda, 2021	China	To study the impact of COVID-19 on shipping and logistics on shipping and logistics	Literature review: using machine learning	No	This study employs web mining and natural language processing to examine public sentiments regarding COVID-19, uncovering three principal insights: (1) Logistics companies emphasized sustainability, concentrating on service effects and alternative solutions; (2) Consumer apprehensions revolved around food security and health, underscoring the significance of essential goods; and (3) A pronounced emphasis on terminology associated with "service" and "China" illustrates its crucial position in global supply chains throughout the pandemic.
Yang et al., 2021	China	To study the dynamic impacts of the COVID-19 pandemic on the regional express logistics	Quantitative: Panel data analysis	No	The significant findings: (1) The changes in inter-provincial express logistics flows due to the pandemic were more significant than those in intra-provincial flows, both displaying considerable spatial disparities; (2) China's response to the COVID-19 pandemic can be classified into four stages based on the severity of the pandemic and policy implications, which mitigated the effects on express logistics; (3) The pandemic's impact on express logistics exhibited substantial variability across different stages, underscoring the effectiveness of both restrictive and supportive measures; (4) The delayed effects of the COVID-19 pandemic on regional express logistics vary according to the selected time lags.
Hohenstein, 2022	German	To study SC risk management strategies for COVID-19	Qualitative: Interview and case study	Yes	This research examines how ten international LSPs navigated significant risks during the COVID-19 pandemic through several case studies. It emphasizes that successful SCRM solutions for managing such disruptions depend on the ongoing adaptation of both proactive and reactive approaches. The study delineates eight critical characteristics influencing the resilience and agility of LSPs in supply chain risk management, providing an enhanced framework that offers insights for addressing infrequent, high-

Authors	Country	Objectives	Techniques to measure resilience	Comparison among service providers	Findings
					impact disruptions, thereby connecting research with practical applications for future investigations.
Dovbischuk, 2022	America and Europe	To study innovation-oriented dynamic capabilities of LSPs, dynamic resilience, and firm performance during COVID-19	Quantitative: Correlation analysis	No	This study established a model that integrates diverse innovation-oriented capabilities essential for improving dynamic resilience in logistics service quality (LSQ) and overall organizational performance. The research discovered six latent components through factor analysis: organizational learning capability, inter-firm resources, innovation, dynamic resilience, LSQ, and firm performance. The findings demonstrated that elevated organizational learning capability, inter-firm resources, and innovation are positively correlated with enhanced dynamic resilience during the COVID-19 pandemic. Moreover, dynamic resilience demonstrated a favorable correlation with better LSQ and improved firm performance.
Garola et al., 2023	Italy	To study the response of express couriers and lessons learned to improve resilience during COVID-19	Qualitative: content analysis	No	Significant findings highlighted the use of four "continuity enablers": visibility, previous knowledge, communication, and digital technology. Companies with extensive networks exhibited superior responsiveness owing to enhanced operational visibility, but smaller enterprises faced challenges due to diminished insights into emerging events. Common tactics encompass prioritizing employee health and safety, modifying work standards, and integrating new technologies to safeguard personnel and maintain delivery continuity.

Authors	Country	Objectives	Techniques to measure resilience	Comparison among service providers	Findings
Herold et al., 2024		To study conceptually the SC resilience capability during disruptions	Qualitative: Conceptual paper	No	This study examines the connection between exploitation and exploration capacities and their significance in exaptation for supply chain resilience, specifically concerning LSPs during and after COVID-19. The authors demonstrate how newly acquired capabilities during crises can be reused to augment supply chain resilience by constructing two frameworks. The research, while recognizing limitations such as its exclusive focus on LSPs and the necessity for larger notions beyond ambidexterity, seeks to enhance comprehension of exaptation in supply chain resilience and advocates for future studies to broaden this paradigm.
Our Study	India	To quantify CEP's resilience during disruptions	Quantitative: Composite index	Yes	

Source: Author's own compilation

2.3 Literature on operating efficiency

Many believe that performance measurement has two sides, one is efficiency, which means the cost-effective use of limited resources, and effectiveness, which is the revenue-generating capability of the organization (Gronoos et al., 2004). Services provided by the courier service operators are more or less the same, so through resource optimization and reduction in transportation cost is the only way to differentiate themselves from others (Fernandes et al., 2017). In fact, logistics accounts for a significant share of the cost of operations in the courier sector, and any improvement can contribute to operational advantage in the organization. Logistics plays a clear role in the strategy of the firm and is a driver for corporate-level growth and profitability (Sandberg & Abrahamsson, 2011). Zenezini (2018) addressed the issue of missed deliveries with a high amount of returns daily by the delivery agents in the depot, which is reflected through high costs. Studies on outsourcing revealed that indeed it is important to improve effectiveness, but without a proper management process, this can have a negative impact and may raise risk and cost (Zhu *et al.,* 2017). Operating efficiency measurement is also connected with time loss ratios from various activities in an organization and can also give a true and fair view of

effectiveness in capacity utilization (Jeong et al., 2001). A few worked on the street address system and delivery service of courier service providers, as street names or addresses create problems for city logistics (Oforiatta, 2015). While some others found that marketing does not have a significant role in the enterprise of transportation, and instead it is an auxiliary function and sales support (Switala, 2013). The function of courier services that consumes the maximum time is collection and delivery (Dobrodolac, 2014). Different approaches are being used to measure the productive efficiency of logistics, and a detailed description of the literature is given in Table 2.2

Table 2.2 Literature on operating efficiency measures

Authors	Country	Techniques	Sector	Findings
Fernie & McKinnon 2003	UK		Grocery	The utilization of vehicles was affected by idle 21%, maintenance/repair 6%, delayed or otherwise loaded and inactive 4%, pre-load, awaiting departure 12%, loading/unloading 16%, running on-the-road 35%, and on-the-road daily 6%. Delays (deviation from schedule) immediately impact the vehicle's time efficiency and fuel consumption. Transport schedule instability can indirectly impact vehicle utilization by complicating enterprises' planning of backhauls and increasing the complexity of multiple collection and delivery rounds. Cause of delays: delivery-point problems, traffic congestion, own company action, collection-point problem, equipment breakdown, lack of driver, no single cause.
Borenstein et al., 2004	Brazil	DEA	Postal sector	This study introduces a performance measurement approach for managers of state-owned enterprises with multi-unit services. The application of DEA for efficiency assessment assists managers in recognizing both high-performing and underperforming units, facilitating corrective measures. It integrates quantitative DEA outcomes with qualitative managerial methods, offering insights for ongoing enhancement beyond mere numerical data. Despite constraints imposed by data availability and static modeling, the methodology provides a pragmatic instrument for evaluating and improving efficiency in the service sector. The study advocates for the dissemination of best practices, the examination of underperforming units, and the modification of the model in accordance with managerial feedback.

Authors	Country	Techniques	Sector	Findings
Min & Joo 2006	North America	DEA	3PL	This article differentiates between successful and underperforming third-party logistics providers based on Data Envelopment Analysis efficiency scores, which act as an early indicator of possible failure. DEA assists in identifying the least efficient third-party logistics providers and serves as a valuable instrument for clients in selecting 3PLs based on resource use. The report emphasizes DEA's function in establishing performance benchmarks for 3PLs, aiding them in prioritizing financial resources and enhancing profitability and competitiveness. The model could be augmented to incorporate additional outputs and third-party logistics providers within analogous industry sectors.
Zhou et al., 2008	USA	DEA and regression	3PL	The decrease in efficiency among certain Chinese third-party logistics providers (3PLs) is associated with a notable reduction in domestic transportation activities resulting from the SARS outbreak and the gradual shift of state-owned firms towards a market-oriented economy. Secondly, a close association exists between sales opportunities and technical expertise with the operational effectiveness of third-party logistics providers, although the size of these organizations does not substantially influence their performance. Third, in contrast to the 3PL sector in the United States, Chinese 3PLs predominantly focus on conventional services such as port management, transportation, and warehousing, rather than assuming the role of integrators or primary service providers.
Kumar 2008	India	DEA	Bank	The paper analyzes the correlation between technical efficiency (TE) and profitability in Indian Public Sector Banks (PSBs) utilizing the 'efficiency–profitability matrix' derived from 2005 data. The research employs Data Envelopment Analysis (DEA) to determine technical efficiency (TE) ratings for 27 public sector banks (PSBs), revealing an aggregate technical inefficiency of 11.5%, which suggests possible output enhancements of 1.13 times with the same inputs. Seven banks demonstrated complete efficiency, establishing the 'efficiency frontier', but inefficiency varied between 2.6% and 36.8% among the remaining institutions. Banks associated with SBI surpassed those in the NB group in operational efficiency. The matrix indicates that 48% of banks experienced substantial input wastage, categorizing them as 'underdog' or 'lucky,' with opportunities for enhanced profitability via improved efficiency. Punjab and Sind Bank, despite being totally efficient, exhibited a negative return on assets (ROA), categorizing it in the 'unlucky' quadrant. Conversely, 33% of Public Sector Banks, such as Andhra Bank and Corporation Bank, occupied

Authors	Country	Techniques	Sector	Findings
				the 'ace' quadrant, demonstrating superior efficiency and profitability.
Kim 2010	Korea	DEA	Truck drivers	This study assesses vehicle performance in logistics with Data Envelopment Analysis (DEA) to quantify technical efficiency. The results indicate considerable disparity in efficiency levels among trucks, with certain models exhibiting great efficiency and others demonstrating marked inefficiency. The inefficiencies differ among labor, fuel, and other input expenses, underscoring the necessity for comprehensive assessments. Moreover, truck capacity and age do not much influence efficiency, and enhancing scale efficiency is more complex than augmenting technological efficiency, as it necessitates modifications to the efficient frontier.
Bang et al., 2012	North America, Europe, Asia, and the Middle East	Two-stage DEA and Tobit regression	Liner shipping companies	The findings indicate that company size (measured by TEU capacity), vessel size, the proportion of chartered ships, the use of new vessels, and the establishment of alliances all positively influence the financial performance of liner shipping businesses. The age and type of the ship did not significantly influence financial performance, nor did either aspect contribute meaningfully to operational performance.
Wanke 2012	Brazilian	Two-stage DEA	3PL	The contribution of this paper is twofold. A theoretical scale for assessing scale efficiency has been devised and validated, functioning as an index for determining the optimal scale size. The management significance of measuring the scale efficiency of third-party logistics (3PL) lies in its potential to serve as a foundation for market segmentation among shippers. For example, does a particular third-party logistics provider demonstrate superior scale efficiency than others? This may indicate multiple issues related to service offerings, negotiation terms, and the trade-offs between costs and service levels, among others.
Arvidsson et al., 2013)	Guthenburg	Interview with CEOs	Road Hauliers	The study concludes that driver efficiency is adequate for long-distance hauls but less successful in urban environments, where skilled drivers could offer greater advantages. Large trucks are deemed inappropriate for urban distribution, and route efficiency is impeded by client time constraints. Back-haul opportunities are constrained by temporal limitations, and CEOs saw a tendency towards smaller, more frequent shipments, which diminishes delivery efficiency. Regulatory measures ("sticks") are perceived as more efficacious than incentives ("carrots"), and although coordinated distribution is regarded favorably, obstacles such as cost-sharing and competition rules hinder its execution.

Authors	Country	Techniques	Sector	Findings
Joo et al., 2013	USA	DEA	3PL service providers	This study evaluates the effectiveness of a 3PL corporate branch in the Northwest USA, utilizing internal data spanning 36 months. Utilizing DEA models, it finds inefficiencies in management, resource allocation, and operational circumstances, emphasizing the necessity to reduce expenditures to enhance profitability via lean operations. The study enhances knowledge by utilizing infrequently accessible internal data, establishing a performance assessment framework, and delivering insights for internal benchmarking. Future research recommends evaluating efficiencies across various branches and performing periodical reviews for ongoing enhancement.
Min et al., 2013	North America	DEA	3PL industry	This study assesses vehicle performance in logistics with Data Envelopment Analysis (DEA) to quantify technical efficiency. The results indicate considerable disparity in efficiency levels among trucks, with certain models exhibiting great efficiency and others demonstrating marked inefficiency. The inefficiencies differ among labor, fuel, and other input expenses, underscoring the necessity for comprehensive assessments. Moreover, truck capacity and age do not much influence efficiency, and enhancing scale efficiency is more complex than augmenting technological efficiency, as it necessitates modifications to the efficient frontier.
Mohan et al., 2013		DEA	Food supply chain	A predominant characteristic of crises and disasters is the significant uncertainty over the delivery of services. The essential components of addressing this difficulty encompass establishing an accurate inventory of requirements, a swift flow of consignment, the transportation of these goods, and a delivery system that operates with maximum efficiency given the prevailing circumstances.
Chen et al., 2016	China	PCA-DEA	Ports	This research employs a combined PCA-DEA model to assess the operational effectiveness of iron ore logistics at ports in Bohai Bay, China. The investigation indicates that Qingdao and Tianjin ports function with great efficiency, whereas Dalian and Tangshan ports need enhancements due to technological or scale inefficiencies. The ports of Yingkou, Rizhao, and Yantai exhibit superior efficiency. The study determines that the PCA-DEA model is helpful in evaluating port logistics, offering significant insights for enhancing efficiency and resource usage.

Authors	Country	Techniques	Sector	Findings
Iwan et al., 2016	Poland	Descriptive analysis	InPost company	The expansion of B2C e-commerce has heightened the demand for effective last-mile delivery in urban areas, exacerbating traffic congestion. A viable approach to diminish conventional road transport deliveries is the use of package lockers, exemplified by those managed by InPost. The worldwide proliferation and increasing utilization of InPost lockers underscore their capacity to influence future urban delivery frameworks and mitigate environmental consequences. The efficacy of this system mostly relies on the appropriate positioning of these lockers. A pilot study in Poland seeks to ascertain strengths, obstacles, and user expectations to enhance the system, with intentions for expansion to additional nations.
Marchet et al., 2016	Italy	DEA	3PL industry	This mixed-method study evaluates efficiency and process innovation in the Italian 3PL industry using DEA models and case study research. It finds that 25% of 3PL providers lead in technical efficiency, while most face diseconomies of scale. Only 10% introduced process innovation during the study period, with 13 companies identified as efficiency leaders and 6 excelling in both efficiency and innovation. Medium-sized, industry-focused companies tend to perform best, leveraging economies of scale and learning, though they adopt diverse business models. The case studies highlight strategies such as strong flow management and partnerships for innovation as key to success.
Cagliano et al., 2017	Italy	Multiple linear Regression	LSPs	The research investigates the determinants affecting the efficiency of logistics service providers (LSPs) in urban distribution. Critical factors such as REACH TIME, WORK TIME, DISTANCE TRAVELLED, and POPULATION DENSITY enhance productivity, whereas excessive vehicle weight and volume diminish efficiency. Socio-economic factors, including income and population density, influence outcomes but are less manageable. The results indicate that enhancing network architecture, vehicle loading techniques, and market structure can markedly increase fleet productivity for urban logistics service providers.
Marchet et al., 2017	Italy	DEA	3PL industry	This research examines efficiency and process innovation within Italy's third-party logistics sector through the application of Data Envelopment Analysis models and case studies. It determines that 25% of third-party logistics providers are positioned on the efficiency frontier, whilst 10% have implemented process innovations to enhance efficiency. The research finds exemplary organizations that employ several tactics, including robust flow management and collaborations with technology providers, to

Authors	Country	Techniques	Sector	Findings
				enhance performance. These findings give essential insights for 3PL providers about benchmarking and expansion, and assist shippers in identifying effective and innovative logistics partners.
Choudhury et al., 2018		DEA	3PL service providers	The study underscores the difficulties of integrating sustainability into the selection of third-party logistics providers, as economic considerations frequently eclipse environmental and social issues due to the 'cost of sustainability.' This expense may dissuade suppliers from engaging in the selection process. The research highlights that sustainability is an incremental process, enhancing over time through the learning curve effect, hence decreasing costs. The research advances a universal methodology grounded in environmental sustainability metrics for the assessment of third-party logistics, encouraging eco-friendly supply chains and nurturing enduring collaborations with a limited number of service providers.
Zhao 2018	China	three-stage Malmquist index model	Agricultural logistics management companies	The study reveals that controlling environmental factors is crucial for improving the input-output efficiency of rural logistics service providers. Government subsidies, establishment years, and state-owned property negatively impact operational efficiency, while government policies and market environments play significant external roles. Chinese rural logistics providers have substantial room for improvement, with inefficiencies stemming from low technical and scale efficiency changes. Additionally, convergence analysis shows operational efficiency was divergent before 2012, but post-2012, technology diffusion has become more active, improving rural logistics efficiency.
Raval et al.,2020	India	DEA	Manufacturing	This study assesses the operational efficiency of Indian manufacturing firms utilizing Lean Six Sigma (LSS) via the DEA methodology. It recognizes high achievers, emphasizes inefficiencies, and offers criteria for subpar units to enhance performance. The results assist firms in optimizing resource allocation, improving customer happiness, and enhancing overall performance, while simultaneously decreasing costs and augmenting profits.

Authors	Country	Techniques	Sector	Findings
Roy et al., 2020	India	MCDM	3PL for food manufacturing companies	The research introduces a hybrid IVFRN-FARE-MABAC framework for the assessment and selection of third-party logistics (3PL) providers for fast-moving consumer goods (FMC), taking into account sustainability criteria such as cost, delivery reliability, environmental policy, and technological proficiency. Providers A3 and A6 were identified as preferred options, with A6 finally surpassing A3 following the use of a dominance index. The sensitivity analysis validated the reliability of these findings. The paradigm adeptly addresses ambiguity and subjectivity in decision-making; however, it may be intricate for managers to implement in practice. The platform is adaptable for application in multiple sectors beyond FMC.
Pachar et al., 2022	India	Two-stage network	Retail chain	The research indicates that the operational and sustainability choices significantly affect the business performance of retail establishments. Inefficiencies occur when stores inadequately integrate these decisions, necessitating focus on waste control, personnel management, and customer happiness. Implementing sustainable practices may elevate expenses; therefore, decision-makers must reconcile operational and sustainability objectives to enhance overall performance. The study proposes standards for underperforming retailers and emphasizes the necessity for further investigation into reverse logistics and periodic efficiency evaluations.
Pratap et al., 2022	India	DEA	E-commerce	According to the proposed classification scheme, the top five providers are categorized as High Performance and Efficient. E-commerce firms are advised to establish enduring relationships with the identified high-performing suppliers. The survey offers genuine insights into supplier performance based on various objective factors. The current study improves the overall performance and productivity of an e-commerce firm by concurrently minimizing input costs and maximizing output quality.
Gupta et al., 2022		AHP-TOPSOSIS	LSPs	This study establishes a paradigm for the selection of logistics providers predicated on sustained service quality, delineating five essential elements. The study employs Fuzzy AHP and Fuzzy TOPSIS to rank logistics providers, identifying competence and communication as the crucial elements. The analysis concludes that PQR Ltd. is the superior provider, emphasizing the significance of sustainable practices and sophisticated IT tools in logistics operations.
Surjandari et al., 2023	Indonesia	DEA	Logistics company	This study uses two approaches to assess the efficiency of last-mile delivery stations: DEA-CA and a Decision Tree (DT) prediction model. Cluster analysis was conducted to address station heterogeneity before applying DEA to each cluster. Among 133 stations in the Leader

Authors	Country	Techniques	Sector	Findings
				cluster, 94 were deemed efficient, while 136 of 466 stations in the Majority cluster met the efficiency threshold of 0.85. The DT model helps identify key factors influencing efficiency, with daily delivery volume being the main determinant. For Majority stations, couriers and time volume were secondary factors, while for Leader stations, time volume and couriers followed inbound volume.

2.4 Literature on competitive advantages

The concept of competitive advantage has been a primary focal point in the subject of strategic management, as firms endeavor to attain a superior position over their competitors and attain long-lasting success in the marketplace (Ma, 2000). Competitive advantage is the ability to compete in the market by accelerating sales and profit growth rates in comparison to other players in the industry through differentiated products and services. According to Barney (1991), "A firm is said to have a competitive advantage when it is implementing a value-creating strategy not simultaneously being implemented by any current or potential competitors". Porter (1985) in his book 'Competitive Advantages: Creating and Sustaining Superior Performance' gave three approaches of generic strategies, namely 'Cost Leadership', 'Differentiation', and 'Focus'. Competitive advantage refers to the distinctive attributes or abilities that enable a company to surpass its rivals and provide exceptional value to its customers (Rothaermel, 2016). Previous research has identified various sources that possess valuable, rare, inimitable, and non-substitutable features, which are crucial for sustaining a long-term competitive advantage (Newbert, 2008). The theories of competitive advantages are discussed from various angles such as market-based view (Porter, 1980; Wang, 2014), resource-based view (Barney, 1991 & 1995; Duncan et al., 1998; Madhani, 2012; Miller & Shamsie, 1996; Priem, & Bulter, 2001; Ray et al., 2004), dynamic capability-based view (Ambrosini & Bowman, 2009; Kaur 2017; Teece et al., 1997; Wang & Ahmed, 2007) and relational view of strategy (Dyer & Singh, 1998; Lavie, 2006).

Because of the dynamic nature of the market, however, such assets cannot always serve as a source of competitive advantage (Kabue & Kilika, 2016). To stay ahead of the competition, businesses need to be nimble and always invent new ways to do things. The study conducted by Gupta et al. (2018) investigates the impact of information systems on

a company's competitive advantage via the lens of the resource-based view (RBV). The authors posit that RBV has been crucial in elucidating the concept of sustainable competitive advantage. However, they argue that it is imperative to reevaluate RBV in order to ensure its continued relevance. The authors propose a contemporary RBV framework that takes into account the transient competitive advantage of information systems. This research enhances our comprehension of information systems as a valuable asset for firms and a catalyst for performance improvement. It demonstrates that information systems are crucial for achieving both long-term and short-term competitive advantages.

The application of the RVB framework to logistics services and supply chain management offers a comprehensive comprehension of competitive advantage derived from the strategic administration of resources and capabilities. RBV highlights the importance of acquiring and utilizing resources that match the VRIN criteria in order to maintain a long-term competitive advantage (Madhani, 2012). Within the realm of logistics and supply chain, these resources encompass a wide range of both physical assets, such as distribution networks and specialized equipment, and intangible assets, such as proprietary logistics methods, real-time tracking IT systems, and robust supplier relationships (Lummus et al., 2001). Logistics organizations that are skilled at efficiently utilizing these resources not only improve their efficiency in operations (Rabinovich et al., 2006) but also enhance their strategic posture in the market. Investments in advanced technology platforms (Stenger in 2011) can improve inventory management. Additionally, unique logistical capabilities like cross-docking or just-in-time inventory systems can lead to cost savings that are hard for competitors to imitate. These talents enhance operational efficiency and establish long-term obstacles for new competitors.

From an academic standpoint, the use of RBV concepts promotes a thorough analysis of how logistics companies develop and utilize resources to achieve long-lasting competitive advantages (Hsiao, 2014). This strategy emphasizes the strategic significance of making resource allocation decisions while continuously developing capabilities that are in line with increasing market demands. In addition, the RBV can be integrated with complementary theories such as organizational learning to examine the processes by which firms develop competencies at the firm level, which are necessary to sustain a dominating position in a constantly changing logistics environment (Olavarrieta & Ellinger, 1997).

Integrating RBV principles into the planning and operational management processes of transportation providers allows them to be better prepared to respond and adapt to the increasing complexities and challenges of the dynamic global marketplace. This enables them to mitigate risks, take advantage of opportunities, and offer secure, reliable, and efficient shipping services.

Strategic management ideas like the resource-based view (RBV), market-based view (MBV), dynamic capabilities view (DCV), and relational view (RV) are studied to acquire a competitive edge. According to the RBV paradigm, organizations with unique, valuable, hard-to-replicate, and irreplaceable resources can compete better (Barney, 1991; Mahoney & Pandian, 1992). MBV emphasizes a company's market position, according to Makhija (2003), while KBV emphasizes its competitive advantage from information generation, retention, and application, according to Grant and Baden-Fuller (1995). The RBV theory posits that a company's unique resources and capabilities are the main drivers of its efficacy. (Barney, 1991; Wernerfelt, 1984). The phrase implies that no corporation would have a competitive edge with the same resources. Thus, resources and competencies must be valuable, rare, imitable, and non-substitutable (VRIN) to preserve a competitive edge (Barney, 1991). As a diverse set of assets, the firm cultivates and enhances these resources over time, resulting in research applications in manufacturing, shipping, pharmaceuticals, energy, tourism, and agriculture. Small enterprises to large corporations are covered by RBV research (Duarte Alonso & Bressan, 2016; Beamish & Chakravarty, 2021).

Based on the 1950s and 1960s structure-conduct-performance model, the MBV paradigm links industry structure and management choices to firm success (Bechtel, 2007). Performance is contingent upon industry-specific variables such as the bargaining power of suppliers and buyers, the potential threat of new entrants, the availability of substitutes, and the level of competition (Porter, 1989). The MBV framework states that external forces impact corporate strategy, resources are mobile, and leaders maximize profits (Peters et al., 2011). MBV research can be used in small to large companies (Purbasari et al., 2020).

Some researchers use the RBV and MBV. Makhija (2003) suggests that RBV components are more influential in dynamic contexts, but Peters et al. (2011) note that MBV requires more financial resources for brand image, while RBV requires a strong vision and network management. MBV emphasizes the firm's products, while RBV emphasizes its resources (Sharma et al., 2004). Combining perspectives can improve goals like estimating human

resource value based on market conditions (Bechtel, 2007) and building a business model (Steininger et al., 2011). According to Huang et al. (2015), RBV promotes a lasting advantage while MBV promotes a transitory advantage.

Integrating RBV with the relational view can increase value, customer satisfaction (Lee, 2022), and worldwide market access (Kraus, 2022). Integration provides long-term competitive advantage (Mahdi et al., 2019; Theriou & Chatzoudes, 2015).

The RBV and DCV are combined to make a dynamic RBV. Integration of resource creation and reconfiguration achieves this (Barney et al., 2021). To stay competitive, companies must actively and flexibly manage their resources and competencies (Li et al., 2023). Companies can better meet customer needs and stay competitive by taking advantage of resource heterogeneity, like size and market entry. First-mover advantage, which is linked to technical leadership, is crucial for competitive advantage (Lieberman & Montgomery, 2013).

The dynamic resource-based view emphasizes relational and informational capacities for long-term competitive advantage. Relational competence involves cooperating inside and across organizations, collaborative innovation capability involves exchanging precise knowledge and minimizing errors (Wang et al., 2017). According to the dynamic resource-based view paradigm, these capabilities connect IT resources, including Industry 4.0 technology, to supply chain resilience.

According to Green (2004) (as cited in Madhani, 2012), there are eight main value drivers of intangible assets, namely customers, employees, partners, products/services, competitors, information, process, and technology, which adds value to the firm. The relationship between SCM (supply chain management) practices, competitive advantages, and organizational performance was examined by Li et al. (2006). A few argued that Resource-based view which measures the unique resources and skills is the main source of competitive advantages (Barney, 1991 & 1995; Bharadwaj et al., 1993; Duncan et al., 1998; Gebauer et al., 2011; Madhani, 2012; Preim & Butler, 2001)) and others argued that there may be enormous resources possessed by a firm but knowledge and dynamic capabilities can give sustainable competitive advantages as it becomes easier to cope up with the changing need of the customers (Ambrosini & Bonman, 2009; Andersen, 2012; Kaur & Mehta, 2016; Wang & Ahmed, 2007; Wiklund & shepherd, 2003). Apart from these, there are various other sources as indicated by existing literature – human capital,

innovativeness, developed technology, organizational structure, brand name, quality of services, price/cost advantage, efficiency, customer centricity (Blankson & Kalafatos, 2004; Hosseini et al., 2018; Kaleke & Morgan, 2017; Li et al., 2006; Otsetova, 2019; Wanng et al., 2011). Apart from internal factors, external factors such as market situation, weather conditions, competition behavior, uncertainty and risk etc. affect operating performance (Andrejic, 2013; Wang, 2017).

Thus, the best way to explain why some of the firms are more successful than others is to know about the ability to achieve a unique advantage over the competitors, which is important for the survival of both the public and private sectors (Jahanshahi & Bhattacharjee, 2019).

2.5 Innovation in last-mile delivery service delivery

Innovation refers to the systematic introduction of new ideas, products, or methods that lead to positive change and improvement (Abdallah et al., 2016). Wagner and Busse (cited in Cui et al., 2012) define innovation as a subjective form of newness, emerging from deliberate management processes aimed at maximizing economic gains. The ability to innovate is essential for maintaining a competitive edge and meeting the evolving needs of customers (Dai et al., 2020). It drives economic growth, fosters creativity, and enables both organizations and individuals to adapt and thrive in a constantly changing environment. Service innovation, a strategy for corporate survival, has garnered significant attention from both researchers and business professionals (Tajeddini et al., 2020). Traditionally, innovation has been categorized into two types: process innovation and product innovation. These correspond to new offerings developed in response to external demands and enhancements made to internal processes (Wang et al., 2015).

Innovation in logistics is closely linked to improved customer service, which in turn boosts overall performance (Cui et al., 2012). Logistics innovation encompasses improvements in technology, services, and products (Oke, 2004) and should be both manageable and aimed at exploitation (Lin, 2007). This article aligns with Cui et al.'s (2012) definition, encouraging logistics companies to view replication as a form of innovation. Research has shown that logistics innovation can lead to competitive advantages and differentiation (Persson, 1991; Twede, 1992). In times of supply chain volatility, logistics service providers (LSPs) are compelled to adapt, whether through new technologies or strategies

(Daugherty et al., 2011). Logistics innovation and LSP innovations are distinct yet complementary (Busse & Wallbenburg, 2013). The process of generating and implementing innovations within an organization is referred to as process-oriented innovation (Busse & Wallbenburg, 2014).

Studies suggest that LSPs in developing countries exhibit lower levels of innovation compared to other service sectors, primarily due to the high costs and low returns associated with innovation (Dai et al., 2020). Despite existing research, innovation studies within LSPs are still in their infancy (Busse & Wallbenburg, 2014). In emerging markets, the importance of logistics service innovation is often overlooked, despite its influence by factors such as customer preferences, absorption capacity, environmental considerations, and geographic reach (Chu et al., 2018). More research is needed to understand the role of innovation in logistics and other service sectors (Dai et al., 2020). Given the unique characteristics of India's postal system—including its organizational culture, government oversight, and intense competition within the logistics sector—it is crucial to explore the innovative initiatives undertaken by India's postal services.

Scholars in the field of innovation have also pointed out that organizations can strategically leverage innovations to compete in both local and global markets (Bhattacharya et al., 2017). Innovation enables companies to realign strategies to respond to changing market dynamics, ultimately enhancing customer value and business performance (Drejer, 2002).

In today's rapidly changing global landscape, the postal service finds itself balancing tradition with the demands of modernization. The rise of digital connectivity has forced traditional postal services to reinvent themselves, integrating new features to remain relevant and efficient. In the context of Industry 4.0, businesses must adapt to the current environment or risk being left behind (Koncová et al., 2021). Innovation has become synonymous with growth, and the postal service (Felisberto, 2012) is no exception. As technology advances, new solutions are required to streamline operations, optimize processes, and meet the evolving demands of a dynamic market. The integration of advanced technologies, such as automated sorting and sophisticated tracking systems, enhances service speed, accuracy, and reliability. Success in the postal industry hinges on embracing innovative approaches alongside logistics efficiency (Laseind & Mpofu, 2017). This synergy will not only propel postal services into the future but also play a crucial role in improving customer satisfaction.

The COVID-19 pandemic brought unprecedented challenges for businesses globally, compelling industries such as travel, hospitality, retail, and entertainment to rapidly adapt. Amid this chaos, the CEP sector has emerged as a vital lifeline for communities worldwide. 'Innovation' is considered one of the elements in building a competitive position (Chatzoglou & Chatzoudes, 2018) and even more crucial in uncertain circumstances.

2.6 Literature on business performance

Financial and non-financial measures can be used to measure organizational performance (Upadhaya *et al.,* 2014).

2.7 Literature on customer satisfaction and service quality

Customers can be divided into three categories viz., Contended, Dynamic and Innovative (Hemalatha, 2010). Great productivity can be achieved by concentrating on customers rather than the employees (Martin & Horne, 2001). By improving service quality, customer loyalty can be achieved (Caruana, 2002). It is advisable to know the users' attitude towards quality of services and their need and expectations to determine the most crucial component which affects their satisfaction level (Rao et al., 2011; Valarmathi, 2010). It is crucial to know the concepts of service quality based on customer satisfaction to map out expectations form a particular service provider or brand (Shanghali, 2015). There is a need for alternative methodology to evaluate service quality to improve operating performance (Wong et al., 2018). Generally, it is expensive to attract the target group than to keep the existing customers. So, the service providers try to retain their satisfied customers to gain loyalty and in turn maximize market growth (Appannan et al., 2013). Earlier studies have identified various variables like the efficiency of system, speed, comfort, convenience, safety, reliable services, special services, demand in the market and innovations. Some suggested the dimensions of SERVQUAL as proposed by Prasuraman et al., (1985) are best to measure service quality (Alabboodi 2019; Prasad et al., 2010; Ratkovic et al., 2017; Shainesh et al., 2000; Shanghali, 2015). These dimensions are assurance, reliability, responsiveness, tangibles, empathy and customer satisfaction is the combined outcome. And even some used this model to measure customer satisfaction and service quality for parcel delivery companies (Choy et al., 2013). Though secondary but

value-added services are crucial to gain the faith of the customers (Kuo et al., 2009) and even this is applicable for courier service providers. The future purchase intention of the customer depends on the present level of satisfaction and the development of courier service innovative ideas can be generated from customers' opinions (Gulc, 2017). Studies were found to establish a relationship between satisfaction and service quality (Ariani et al., 2019; Cronin et al., 2000; Kuo et al., 2009; Otsetova, 2016; Rao et al., 2011; Saravanan *et al.*, 2007; Shanghali, 2015). Some studies have measured the customer satisfaction of Indian postal services (like Hemlatha 2010; Mahadev, 2015; Potdar, 2015; Purohit, 2017) and found that customer's preference for post office services are declining due to innovation in ICT and also the emergence of private courier services (Anvekar, 2007). Others have done a comparative analysis of public and private courier service users considering the different segments of customers (Pisal, 2003; Selvakumar, 2007). Perception differs concerning the category of customers, how they measure service quality of a particular service provider, the purpose of use, and the circumstances and satisfaction as well (Valarmathi, 2010). Zenezini et al. (2018) suggested that uses' behavior can influence the strategic decision of courier, express and parcel companies and drive the introduction of new delivery services. The recent studies on service quality are discussed in Table 2.3.

Table 2.3 Recent studies on service quality

Sl. No.	Authors & year	Country	Sector	Methods	Objectives	Findings
1	Echaniz et al. (2018)	Northern Spain	Public transport services	Two-stage ranking-based attribute survey; SVM, BM, SVMW	To assess the user significance of variables in perceived quality evaluation	More complex models better represent reality. There is a threshold where the amount of data needed to support model complexity becomes inefficient, and the effort spent is not justified by enhanced forecast accuracy.
2	Suresh et al. (2019)	India	Supermarkets	Interpretive Structural Modelling and MICMAC	Seeks to identify and analyze the primary aspects that impact the quality of service in supermarkets.	Important factors of supermarket service quality are distribution drivers, price, reliability, and service orientation

Sl. No.	Authors & year	Country	Sector	Methods	Objectives	Findings
3	Phan et al. (2021)	Vietnam	Container port	EFA, CFA, Multiple linear regression; ROPMIS model	To explore the idea of port service quality and analyze its impact on customer satisfaction within the container port industry.	PSQ consists of four elements and sixteen items. Improved PSQ has a good effect on customer satisfaction, with the greatest impact being on the outcomes of port service performance and its image.
4	Restuputri et al. (2020)	Indonesia	Logistics service providers	Kaisi Engineering, PLSSEM	To develop a service model for LSPs in document and package delivery by examining the links between elements of service and customer perception.	This study utilized a questionnaire instrument from a prior study, which was expanded to include 39 service characteristic items, three trust instruments, and three loyalty instruments.
5	Slack et al. (2020)	Fiji	Supermarket	EFA, Correlations, multiple linear regression; SERVPERF	Examines how service quality characteristics and customer satisfaction affect customer repurchase intention, word-of-mouth, complaining behavior, and price sensitivity.	The loyalty behaviors are strongly influenced by customer satisfaction. Customer satisfaction significantly decreases customer complaints and price sensitivity.
6	Villapando et al. (2021)	Philippines	Courier Services	AHP, Prioritization matrix, QFD; SERVQUAL model	Compares the customer satisfaction of delivery couriers and ranks them based on the customers' ratings using AHP.	
7	Masudin et al. (2022)	Indonesia	Logistics service providers	Kaisi engineering, PLSSEM; SEVQUAL model	Assessed the impact of consumer satisfaction with LSP services on customer loyalty amidst the COVID-19 pandemic.	
8	Su et. al. (2022)	Vietnam	Mobile food delivery service (MFDS)	PLSSEM	To analyze the MFDS in terms of its functional and technical quality, and to empirically assess how functional and technical quality impact customer loyalty.	Functional quality has a direct significant effect on loyalty towards MFDS, while no such effect was found with respect to technical quality. It also finds that customer perceived value mediates the link between service quality and customer loyalty

Sl. No.	Authors & year	Country	Sector	Methods	Objectives	Findings
9	German et al. (2022)	Philippines	Package delivery service	PLS-SEM, based on PEPB theory and SERVQUAL model	To examine the determinants that impact consumers' inclination to select a package delivery service amidst the COVID-19 outbreak.	Consumers' desire to select a package delivery service during the pandemic is significantly influenced by their perceived environmental concern, perceived authority support, subjective norm, attitude, service quality, customer perceived value, and customer satisfaction.
10	Chao et al. (2023)	Taiwan	Ocean Freight Forwarders	SEM with Network DEA	Aimed to build a model to determine the average influence of service quality on the loyalty of OFF consumers.	Small business customers value OFF business personnel professionalism, cargo damage claim handling procedures, and booking convenience, while large business customers value container pickup and delivery punctuality and accuracy. Large corporate customers are likely to establish great loyalty. OFFs should try more to increase large company customer loyalty due to the huge disparity between present and expected loyalty.
11	Loya et al. (2023)	Philippines	Two-wheeler service center	QFD	To evaluate the service quality of two-wheeler service center using QFD	The technological capabilities of working processes, such as service delivery, service characteristics requirements, etc., are evaluated, and technical requirements are defined. The QFD house helps management organize and plan procedures and increase service center quality to survive and develop in the market.

Sl. No.	Authors & year	Country	Sector	Methods	Objectives	Findings
12	Carter et al. (2023)	Australia	Pharmaceutical	CBSEM analysis	Study reveals impact of consumers' perspectives of service quality and price competitiveness on patronage loyalty, patronage disloyalty, and loyalty intentions.	High-quality service is more successful than competitive pricing in fostering loyalty behavior and intentions.
13	Rashid and Rasheed (2024)	Pakistan	E-Commerce industry	PLSSEM; SERVQUAL model	To ascertain the impact of logistics services on customer satisfaction in the e-commerce sector.	There was no effect of product availability, delivery time, and shipping cost on the level of product satisfaction. The quality of the product and the quality of the information had a notable and favorable impact on the product satisfaction.
14	Yoganandan et al. (2024)	India	International freight forwarders (IFF)	CBSEM; based on SERVQUAL	To examine the logistics service quality of the IFF	Validated that tangibility, responsiveness, reliability, empathy, assurance, and value exhibit a positive correlation with consumer loyalty, whereas the safety component exerted a negative influence on it. Satisfaction positively influences consumer loyalty.
15	Present study	India	Courier, express, and parcel services	PLS-SEM	To explore the relationship among courier service quality, customer satisfaction, customer loyalty and disloyalty, and willingness to pay	

The future orientation of the logistics business is in the creation of a new generation of technology systems that incorporate advanced technologies (such as big data, artificial intelligence, cloud computing, Internet of Things, modern communication technology, and blockchain) (Mu & Wang, 2020). Prior research in service quality and consumer satisfaction literature suggested that there may be a strong correlation between the quality

of business technologies used and customer satisfaction with the service (Khan et al., 2024; Abbas et al., 2024; Shah et al., 2023). The delivery of a service through technology results in customer satisfaction and plays a key role in boosting customer loyalty (Ayinaddis et al., 2023). Traditional logistics and supply chains have been transformed by IT adaptation, resulting in a variety of advantages, including enhanced responsiveness and efficiency (Gunasekaran et al., 2017; Subramanian et al., 2014). The disruptions and evolutions of AI pose challenges to old notions, requiring a deep understanding of the intricacies of logistics and supply chain management (Richey Jr et al., 2023). This approach should align with the dynamic and innovative nature of AI, which aims to enable smooth integration and application, resulting in increased productivity, sustainability, and resilience (Richey Jr et al., 2023; Brau et al., 2023). Technology service firms offer numerous advantages, such as technological advancements, enhanced customer satisfaction, and reduced staffing expenses, all while promoting environmentally friendly growth and innovation (Khan et al., 2024). However, AI is predominantly used in developed countries (Zhao & Xie et al., 2020), but its implementation is still restricted in emerging nations, including India, where it is just in its initial phases of adoption (Shah et al., 2023).

Numerous researchers (Buttle, 1996; Llosa et al., 1998; Gulc, 2020) expressed concerns about SERVQUAL's capacity to effectively measure the various aspects of service quality in different sociocultural and economic settings (as cited in Thai, 2015). Authors have questioned the validity of this model (Lin et al., 2000 & Imrie et al. 2000), argued that the proposed dimensions of service quality are either excessive or insufficient and unsuitable for some types of businesses, such as commercial banks (Guo et al., 2008) or supply chains (Seth et al., 2006). Research emphasizes the importance for logistics service providers to improve their ability to withstand and recover from challenges by being adaptable, having operational flexibility and efficiency, and integrating digital technology (German et al., 2022; Gupta et al., 2022), in addition to other aspects of service quality. These are crucial for preserving supply chain resilience and enhancing response tactics during disruptive occurrences (Garola et. al., 2023). Instead of using standard dimensions, industry-specific measures are necessary, as stated by Chowdhary and Prakash (2007) and Phan et al. (2021). Like other businesses, the CEP sector faces challenges in achieving satisfaction of customers across various dimensions of service quality.

Service quality and customer satisfaction

Logistics, predominantly overseen by third-party logistics service providers (LSPs), plays a vital role in the management of supply chains, particularly during emergencies such as the COVID-19 pandemic (Uvet, 2020). Research emphasizes the need for restructuring logistical operations to guarantee uninterrupted corporate operations and adapt to the evolving needs of customers (Restuputri et al., 2021). Most of the studies that were reviewed used the SERVQUAL method to assess the qualities of good service (Yu et al., 2013; Yee and Daud, 2011). Yee and Daud (2011) studied the effect of several aspects of service quality on customers' satisfaction with package delivery. According to the results, tangibility, dependability, and certainty significantly impacted customer satisfaction, although empathy and responsiveness did not. While Tabassum and Badiuddin (2014) built their research on top of the same methodology, they did make several adjustments to accommodate the specific needs of courier services (cited in Gulc, 2021). There was the widest gap in the reliability and responsiveness categories, so courier services should work to close it. Yu et al. (2013) proposed the first theoretical framework, which entailed improving courier quality service using the Two-Stage Quality Functional Deployment (QFD) method to turn demand for express services into available resources for those services. While this study did find ways to improve service quality internally, it did not determine whether or not these same factors affected customers' perceptions of service quality. The logistic service quality scale (LSQ) was utilized by some authors (Liu and Liu, 2014; Ho et al., 2012), while other authors (Valaei et al., 2016; Gulc, 2017) sought to develop their own distinct set of dimensions for courier services. Liu and Liu's study applied the SERVPERF technique to evaluate the express logistics service quality. The results showed that customers were dissatisfied with the reliability, empathy, and safety of the expedited service (Liu and Liu, 2014). Another author built a scale called "CouQual" that is tailored to the context of courier services (Valaei et al., 2016). According to the results, the most important factors were timeliness, security, and ease of use, whereas correctness and tangibility had no positive influence on how people perceived the quality of the service. The authors studied the service quality concept in different sectors. Table I presents a description of the relevant articles.

Service quality and customer loyalty; service quality and customer disloyalty

Customer loyalty is a complex concept consisting of two distinct aspects: attitudinal loyalty, determined by the readiness to recommend a service to others, and behavioral loyalty, evaluated by the frequency of repeat purchases (Kyle et al., 2010). Positive service experiences are commonly acknowledged to enhance customer loyalty development (Zeithaml et al., 1996). Several investigations, such as Ladhari (2009), have confirmed a direct correlation between service quality and customer loyalty. Negative service experiences are associated with customer disloyalty, which can be shown in their price sensitivity and tendency to complain (Singh, 1991). Kelley et al. (1993) and Zeithaml et al. (1996) suggest that there is a negative relationship between service quality and customer disloyalty. Bloemer et al. (1999) investigated the connections between the five SERVQUAL qualities and consumer loyalty and disloyalty. The literature on different business sectors is conflicting, creating a gap in comprehending the complex links among service quality aspects and loyalty of customers and disloyalty despite extensive research (Slack, 2020). Further research is necessary to fully comprehend and resolve the contradictions in the current knowledge base due to the intricate nature of these connections.

Customer satisfaction and customer loyalty

The relationship between consumer satisfaction and loyalty to a company is fundamental to the success and longevity of a flourishing business (Ponirin et al., 2009). Customer satisfaction with a product or service establishes the foundation for loyalty, fostering a connection that goes beyond individual transactions. Contented customers not only have a higher probability of making further purchases, but they also transform into brand ambassadors, disseminating pleasant experiences to others. Loyalty, on the other hand, is distinguished by a profound emotional bond, confidence, and a dedication to a specific brand over an extended period of time (Martin-Consuegra et al., 2007). The reciprocal relationship between satisfaction and loyalty is apparent, as devoted customers, motivated by their favorable encounters, make substantial contributions to a company's earnings through recurring patronage and word-of-mouth endorsements. This dynamic connection emphasizes the significance of consistently surpassing customer expectations, attentively considering customer input, and nurturing a customer-focused strategy to cultivate lasting loyalty in a competitive marketplace (Verhoef, 2003).

Customer satisfaction and customer disloyalty

Singh (1991) found that a negative service encounter might lead to customer disloyalty, characterized by increased price sensitivity and complaint behavior. According to researchers (Zeithaml et al., 1996; Kelley et al., 1993; Slack et al., 2020), there is an inverse correlation between service quality and consumer disloyalty, as indicated by price sensitivity, switching, and complaint behavior.

Customer satisfaction, loyalty, disloyalty, and willingness to pay

Customers are known to be willing to pay a higher price for goods and services that offer extra value (Sum and Teo, 1999). There is a positive correlation between the inclination to spend more money and the loyalty towards a particular attitude. According to Jaiswal and Niraj (2011), this indicates that highly devoted online customers are inclined to remain loyal to an e-commerce platform and are willing to pay a higher price for it. Customers are willing to pay more when they see a service encounter as having value beyond its price (Pine and Gilmore, 1998) or when they perceive business-customer interactions as being customer-centric (Gronroos, 2017).   The utility of this arises from the fact that it allows for charging higher prices without requiring further direct investments. This remains the primary factor in driving shareholder value (Doyle, 2001).   A product or service receives a price premium when the price that customers are willing to pay exceeds the price they are willing to pay for similar products or services in the market (Aaker, 1996).   Businesses can incentivize clients to pay a higher price by delivering excellent services that exceed customers' expectations (Izogo et al., 2021). Consumer satisfaction has a significant influence on client loyalty, leading to an increased readiness of customers to pay a premium (Xu & Gursoy, 2015). Within an online service model, the customers' willingness to pay is negatively associated with their perception of the service's unfairness. According to Wang et al. (2005), under an online service model, customers' willingness to pay is negatively connected with their perception of the service's fairness.

2.8 Methods of weighing and aggregation in composite index

When constructing composite indicators, weights have a substantial impact on the overall outcomes. Numerous composite indicators depend on equal weighting, whereby all variables are allocated identical weights. However, the act of assigning weights has a

more profound significance in the development of composite indices (OECD, 2008, pp. 31–33, as cited in Greco et al., 2019). Firstly, weighting represents the 'explicit significance' assigned to each criterion in the composite index. A weight can be defined as a coefficient that is allocated to a criterion, therefore reflecting its size in relation to the other criteria. Furthermore, the method of weighing transmits the 'implicit significance' of the characteristics by considering the compromises between criteria during the aggregation procedure. Therefore, the selection of weights affects both the apparent and empirical effect of certain factors on the whole indication.

Through the exploration of various aggregation approaches, researchers can enhance their comprehension of the consequences of their selected weighting paradigm on the ultimate composite score. Table 1 illustrates the various approaches, like equal weight, participatory, data-driven, and MCDM methods (El Gibari et al., 2019; Greco et al., 2019; Libório et al., 2022) that can be employed to ascertain the weight of sub-indicators in composite indices. Researchers frequently raise concerns regarding the equal distribution of weights to sub-indicators, as they may differ in their relative significance when reflecting the business landscape (Tofallis, 2013). Participatory weighting systems are considered more efficient than data-driven methods for assessing only country-wise economic performance and competitiveness (Lafuente et al., 2020). However, the data-driven approach is more 'objective' and reliable as limited to cognitive assessment error and biases of the experts (Zhou et. al., 2007; OECD, 2008; Decancq & Lugo, 2013; Greco et al., 2019).

An analysis of alternative aggregation approaches, such as simple average, geometric mean, or weighted average, can offer a useful understanding of how specific weighting methods might affect the overall outcomes of the composite index (Greco et al., 2019). The uncertainty inherent in composite indicators renders them susceptible to fluctuations in scores and ranking outcomes, regardless of the applied methodology (Dialga & Giang, 2017). The difficulty lies in reconciling the aim to enhance the accessibility of composite index generation with the requirement to create reliable tools that reduce uncertainty and sensitivity in the end result scores, which may appear to be contradictory goals.

2.8.1 *Equal weighting method (EWM)*

The equal weight approach is a widely used technique for integrating indicators in composite indices, where each indicator is assigned equal significance in the ultimate computation. This methodology is uncomplicated and readily implementable, rendering it a prevalent option for researchers seeking to streamline their investigation. In index computation, the equal weighting approach assigns the same weight to each component. Previous research indicates that assigning equal weights to factors can introduce randomness in factor mispricing, modify exposures to risk factors, and prevent biases in market value. This makes it attractive to individuals who perceive the market as inefficient (Dash & Loggie, 2008; Zeng & Luo, 2013). Implementing equal weighting prevents the skewed mistakes commonly seen in market-cap indices, which tend to excessively invest in overvalued equities (Zhou et al., 2007). In indices such as the S&P 500, EWI has demonstrated superior performance in comparison to market-cap-weighted indexes, which can be attributable to their distinct risk exposures and rebalancing procedures (Zeng & Luo, 2013). Nevertheless, the extent of this superior performance differs depending on the prevailing market conditions, which are affected by a blend of risk factors related to size and style (Dash & Loggie, 2008). In addition to equities, the equal weighting strategy has been expanded to encompass fixed income, commodities, and international equities (Zeng & Luo, 2013). In non-financial domains, such as the Human Development Index (HDI), equal weighting is employed to prevent arbitrary weight selection and offer an equitable and objective approach to calculating the index (Tofallis, 2013; Karagiannis & Karagiannis, 2020). Evidence from statistical analysis confirms that equal weighting in the HDI effectively captures the majority of data variability and provides a well-balanced assessment of development (Karagiannis & Karagiannis, 2020).

The equal weighting approach is criticized for presuming all indicators contribute equally, which might not fairly represent their actual significance (Greco et al., 2019; Liborio et al., 2022). This can cause less precise outcomes and weaken the relevance of more potent markers. Regular rebalancing to keep equal weights can also raise transaction costs and turnover. The technique also ignores contextual elements, such as market conditions or professional knowledge, which could provide a more customized solution. Critics of equal-weighted indices point to higher turnover and capacity limits compared to market-cap indices (Dash & Loggie, 2008; Dash & Zeng, 2010). However, it may not always be the most suitable approach as it fails to consider the differing degrees of

significance of various indicators. In such circumstances, more advanced approaches like PCA, FA, DEA, or AHP can provide a more nuanced approach to weighing indicators and constructing composite indices.

2.8.2   Data-driven approach

2.8.2.1 Correlation and Multiple Linear Regression Analysis: Correlation analysis is commonly employed during the early phases of developing composite indicators to investigate the connections and dynamics among sub-indicators (Booysen, 2002). The analysis can uncover robust correlations, which can impact the weighting procedure based on the chosen methodological approach. Ray (2008) presents two approaches for inferring weights from correlation analysis: one using a basic correlation matrix, where weights are directly proportional to the total absolute values, and the other, referred to as the 'capacity of information,' which assigns weights based on the correlation between each indicator and a selected unique variable. Although a key constraint of these approaches is that correlations may lack statistical significance, and even if significant, they do not necessarily imply causation, but rather the simultaneous movement of indicators (Freudenberg, 2003).

Through the analysis of the causal link between sub-indicators and a selected output indicator, multiple linear regression can be employed to calculate weights. Nevertheless, this approach must acknowledge two primary constraints. Primarily, it presupposes rigid linearity, a condition that is seldom observed in composite indices (Saisana et al., 2005). Secondly, the existence of an objective output indicator would render a composite index unnecessary (Saisana & Tarantola, 2002). In order to tackle this issue, several researchers employ well-recognized indicators, such as the logarithm of patents to quantify the national innovation index or GDP per capita for more comprehensive socio-economic criteria (Ray, 2008). However beneficial, these methods run the danger of compromising the intended function of composite indicators, which strive to surpass only economic metrics (Patrizii et al., 2017). Canonical correlation analysis can be used in situations when two or more output variables are involved (Saisana & Tarantola, 2002).

2.8.2.2 Principal Component analysis (PCA) and Factor analysis (FA): PCA (Pearson, 1901) and FA (Spearman, 1904) are statistical techniques employed to reduce the number of dimensions in a dataset. But they are different mathematically and conceptually (Wang 2009). Their objective is to accurately explain the highest amount of variation in the

original data using the fewest feasible components (Ram, 1982). PCA converts data into linear equations that elucidate variance, whereas FA posits fundamental shared patterns influencing the data. Both approaches necessitate making decisions, such as determining the quantities of components to keep, therefore introducing a subjective element. They are frequently employed to assign weights to composite indicators, especially in domains such as well-being and poverty, and find utility in prominent indices such as HDI (Noorbakhsh, 1996), Environmental Degradation Index (Bandura, 2008), and Internal Market Index (Saisana & Tarantola, 2002).

Despite their popularity stemming from their objectivity and transparency, these approaches have inherent limits. These assumptions presuppose continuous data and linear correlations, which may not always be valid (Greyling & Tregenna, 2016). Furthermore, the weights of PCA/FA are determined by statistical characteristics rather than theoretical connections, and modifications in data or outliers can greatly impact the outcomes (Saisana & Tarantola, 2002). Although robust varieties of PCA exist, these approaches may not always accurately represent the fundamental reality and can be influenced by changes across time and space, which can complicate comparisons.

FA is sometimes seen as more advantageous than PCA in specific situations due to its emphasis on ascertaining latent variables that account for the relationships between observed variables. FA exclusively captures the common variation, making it better suited for revealing shared factors, whereas PCA encompasses both common and unique variance (Wang, 2009). This differentiation enhances the interpretability and theoretical foundation of FA, particularly when seeking to comprehend certain constructs in a large dataset (Park et al., 2002). Furthermore, FA takes into consideration error terms, therefore offering a more lucid perspective on measurement error, while PCA treats all variation uniformly. However, FA is more intricate, while PCA is simpler and more suitable for pure data reduction (François & Jay, 2020).

2.8.2.4 Data Envelopment analysis: DEA (Charnes et al., 1978) is a highly effective and widely used mathematical programming for integrating indicators in composite indices. This method is highly valuable for calculating efficiency ratings by comparing several inputs and outputs within a certain system (Cooper et al., 2000; Zanella et al., 2015). Achieving optimal weights for each parameter enables researchers to determine the most efficient resource allocation strategies and enhance performance (Rogge, 2012). This

approach not only streamlines intricate data structures but also offers significant insights for decision-making processes in diverse domains including medicine, finance, and economics. With this approach, researchers can use quantitative weighting, i.e., linear programming, to make educated judgments and deepen their comprehension of performance evaluation under some given constraints (Hermans et al., 2008). However, the accuracy of efficiency representation in DEA may be compromised if the weights allocated to each indicator are not meticulously evaluated and modified (Cherchye et al., 2007). Excessive emphasis on one indicator compared to others may distort the results and result in erroneous conclusions regarding resource allocation and performance enhancement.

2.8.3 Participatory Approach

2.8.3.1 Analytical Hierarchy Process (AHP): Effective analysis of the weights can also be achieved using the AHP approach, originally introduced by Saaty (1977). It is a decision-making technique that facilitates the prioritization and selection of the optimal alternative from a given collection of possibilities by decomposing intricate decisions into smaller, more easily handled components (Ishizaka & Nemery, 2013). Through pairwise comparisons and mathematical computations, the method enables researchers to methodically ascertain the relative significance of each indication and subsequently modify the weights (Ishizaka 2012). This approach enhances the precision of efficiency assessment in performance evaluation, thereby facilitating well-informed decision-making in diverse domains, including economics, finance, and healthcare etc. However, a comprehensive criticism of the AHP approach may occur when the decision criteria lack sufficient clarity or when subjective biases impact the pairwise comparisons (Roszkowska, 2013). When the number of indicators is very large, the ultimate rankings may not precisely represent the weight given by decision-makers, resulting in possibly erroneous decision results (Ishizaka 2012; Sureeyatanapas et. al., 2018).

2.8.3.2 Conjoint analysis (CA): This expert-opinion-based method is employed in market research to get insight into the decision-making process of individuals when confronted with several traits or features (Green & Srinivasan, 1978). CA is a divergent approach from AHP in that it starts by evaluating general preferences and thereafter establishes the relative importance of specific criteria. CA computes the marginal rates of substitution of the overall probability function in order to provide indicator weights. These weights are

obtained by dividing the range of significance for a criterion by the total sum of all criterion ranges (Maggino & Ruviglioni, 2009). Despite its ability to offer useful insights, this approach is limited by its complexity, requirement for a large sample, and difficulty in calculating a predetermined utility function (Wind & Green, 2013). Specifically, certain characteristics that are considered desirable in one culture may be interpreted unfavorably in another culture, resulting in erroneous inferences (OECD, 2008).

Table 2.4 Sources and characteristics of some composite indices

Authors	Composite indicator (CI)	Sector	Weighting of variables	Ranking of service providers	Validation of Index
Raposo et al., 2009	Patient's satisfaction index	Healthcare	Unstandardized regression coefficients	No	No
Abdullah et al, 2011	Bank service quality index	Banking	Standardized regression coefficients	No	No
De Oña et al., 2015	Index for transit service quality	Transport service	Importance of attributes	No	No
Chadee et al., 2018	Urban intensity index	City logistics	Product of score coefficient and percentage of variance explained	No	Yes
Our study	Competitive preparedness index/ Courier service quality index	Courier, express, and parcel	Squared factor loading scores	Yes	Statistical validation

Source: Author's own compilation

Table 2.4 provides a comparative overview of studies that utilize composite indicators (CIs) to evaluate service quality or satisfaction across various sectors. Composite index is a useful method for aggregating multiple dimensions into a single metric, providing a holistic view of service performance or preparedness. The studies included in the table highlight the diversity in approaches to weighting variables, validation techniques, and applications across different industries. A range of weighting methods is used to construct the indices. Not all studies validate their composite indices statistically. The absence of validation in many cases suggests potential areas for improvement in the robustness of CI methodologies. Overall, the table underscores the evolution and diversity of composite indicator studies across sectors. While they serve as valuable tools for performance evaluation, challenges such as standardization, validation, and applicability for comparative analysis remain prevalent. Future research could benefit from addressing these gaps to enhance the utility and reliability of composite indices.

2.9 Research Gap

Based on the literature review, gaps have been identified that need to be addressed to provide insights and critical viewpoints for the development of this sector.

(i)   Wang (2017) discussed supply chain uncertainty and risk and suggested that external factors such as customers, environmental issues etc. are more crucial than internal factors. Epidemic or pandemic outbreaks are the most unpredictable (special) cases that increase the uncertainty and risk of global supply chains (Ivanov, 2020). Due to the SARS outbreak in 2003, Chinese 3PLs faced a decline in domestic transportation activities (Zhou et al., 2008). Thus, the impact of recent pandemic disruption, i.e., the COVID-19 phenomenon, is yet to be found in relation to the CEP industry at the domestic level in local markets.

(ii) There are debates among researchers regarding the competitive advantages that can yield superior performance to a particular sector and factors affecting the growth (Kaleke & Morgan, 2017; Soloducho-Pelc, 2014; Wang, 2014). Thus, a gap exists for conducting further studies focusing on both the competitive advantages of the players and the organizational performance of CEP service providers.

(iii) There are many studies from a firm's perspective (Chodakowska & Nazarko, 2016; Faroos, 2019; Karcz & Slusarezyk, 2016; Marchet et al., 2017; Zhou et al., 2008) and some based on customers' perception (Harrington et al., 2016; Ho et al., 2012; Noordin *et al.,* 2017; Pisal, 2003) to evaluate the logistics service providers. Only a few research studies have focused on both these aspects together. (Asthana & Dwivedi, 2020; Lasis, 2018; Mahadev, 2015). Thus, a gap exists for conducting a study incorporating both CEP service providers' and users' perspectives in times of disruptions.

(iv) Current research provides scant insights on how successful logistics service providers (LSPs), specifically courier, express, and parcel services, are in navigating a disruptive event and cultivating resilience for the future. Only three international studies explicitly examine LSPs, each with a distinct emphasis: Herold et al. (2021) examined how LSPs addressed operational and financial difficulties during the COVID-19 crisis, identifying new strategies to address disruptions. Hohenstein (2022) investigated the adequacy of supply chain risk management (SCRM) systems in providing robustness and agility for LSPs to foresee probable disruptions. Garola et al. (2023) examined the role of express

couriers throughout the pandemic, assessing their development of essential capacities and identifying lessons learned along with potential future obstacles. At National level, (Mahadev, 2015; Pal et al 2010; Potdar, 2015; Selvavinayagam et al., 2018) and at state level (Dutta & Borah, 2018), studies were conducted on the role, issues, challenges, efficiency, customer satisfaction, adoption level of technological innovations etc. of the Indian postal system but no such studies have been found on preparedness of CEP service providers in times of disruptions.

(v) The researcher could find negligible studies emphasizing empirical investigation on intense competition among CEP service providers. The present study seeks to respond to academics' requests for empirical investigations that quantify organizational resilience (Koh et al., 2024) in the face of disruptive events and to examine organisation reactions to such crises (Choi, 2021; Ivanov & Dolgui, 2020) via the assessment of competitive preparedness.

Therefore, this study aims to measure the CEP industry's resilience against disruption and explore the level of competitiveness preparedness among the CEP service providers.

2.10   Research Questions

The research questions are formulated as:

RQ1 How did CEP service providers respond to disruptive events, including the recent pandemic?

RQ2 What level of customer satisfaction and behavioral intentions regarding service quality were observed during a disruptive environment?

RQ3 How to quantify the resilience of the CEP industry against disruptions?

RQ4 What is the status of competitiveness preparedness among the CEP service providers in India?

2.11 Summary

This chapter presents a comprehensive analysis of the literature across various regions and countries. The findings indicate that only a limited number of studies have explored logistics resilience in the context of disruptions. Additionally, there is a noticeable lack of research examining the CEP sector from both service providers' and customers' perspectives within the same study. While the SERVQUAL model remains a widely used scale in the service sector, it is not suitable for the present study due to several limitations. Addressing the challenges posed by disruptive events in the service industry necessitates the development of a new, specialized scale. Furthermore, there is a pressing need for multidimensional quantitative studies to measure logistics resilience effectively. In the Indian context, the literature reveals a significant gap in in-depth studies focusing on the CEP sector. This underscores the critical need for a competitive preparedness analysis of courier, express, and parcel service providers during disruptive events. Such research is essential for ensuring growth and sustainability in a highly competitive and dynamic market.