

Evaluating The Pandemic's Impact on Third-Party Logistics Key Performance Indicators in South Africa Retail Industry

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Keywords

Logistics

Pandemic risks

3PL

Key performance indicators

Abstract

The COVID-19 pandemic has disrupted global supply chains, notably affecting third-party logistics providers (3PLs) in South Africa's retail sector. This study examines the pandemic's impact on 3PLs' key performance indicators in this industry. Findings reveal challenges like supply chain interruptions, fluctuating customer demand, and ensuring employee safety. Recommended strategies include digital technology adoption, resilient supply chain development, enhanced communication, health prioritization, and adaptive monitoring. These insights can guide 3PLs and stakeholders in South Africa and globally in navigating pandemic-induced challenges.

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1. Introduction

The South African retail sector is the third-largest contributor to South Africa's GDP. As a result of structurally weak government finances, continuing power shortages, bleak industry growth, and diminishing trade in goods and services, South Africa was already in an economic depression before the start of the pandemic, according to Anie et al. (2020). Poor economic performance coupled with the pandemic resulted in a further decline in the GDP. Third party logistics, or commonly referred to as 3PL, services help businesses to focus on their core business operations. However, the performance measurement of 3PL operations using Key Performance Indicators (KPIs) is essential for monitoring the efficiency of these operations. Chitta (2017) defines 3PL as a business process adopted by businesses in which they outsource their logistics and procurement operations to a service company that specializes in effectively managing various logistics functions such as transportation and warehousing. Gunasekaran et al. (2015) suggest that performance indicators are essential managerial decision-making tools in businesses. While measuring performance has become quite a challenge in today's economy, in the logistics business, it is necessary to develop a framework for adopting a strategic performance measurement system for 3PL providers by using a comprehensive approach to assess an appropriate mix of indicators (Rajesh et al., 2012). This makes it possible for companies to comprehend what is expected of them to achieve strategic alignment.

1.1. Problem Statement

The supply shock in China in February 2020 and the ensuing market shock in the global economic period shutdown unveiled flaws in companies' manufacturing and supply chains across the globe (Shih, 2020). The prolonged shutdown of areas of the global economy influenced the supply chains as supplies were exhausted. In a report by Baker McKenzie (2020), it is asserted that opportunities exist in online retail "as consumers turn to online shopping to avoid crowded stores, and as more restrictions force non-essential goods retailers to close". As such, businesses that can easily transition from a physical location to an online store, or whose supply networks are resilient enough to sustain substantial shock would be well positioned to satisfy demand and sustain customers' trust (Baker McKenzie, 2020).

It is important to indicate that the rapid spread of the virus, which led to the South African government's implementation of lockdown restrictions in the country, affected many businesses (Arndt et al., 2020). Furthermore, the restrictions and insufficient demand for goods and services resulted in a 4.2% decline in South Africa's total retail sales in 2020, as reported by Arndt et al. (2020). As Arndt et al. (2020) pointed out in the second quarter of 2020: "Compared to the first quarter of 2020, the number of employed individuals declined by 2.2 million to 14.1 million, according to the Labour Force Survey for the second quarter of 2020, total pay earnings have decreased by almost 30%, whereas gross operating surplus has decreased by about 40%."

In light of the above issues, the research problem explored in the study concerns the challenges faced by 3PL companies in the online FMCG sector of the retail industry during the global pandemic and recommendations are provided to counter such challenges in the future.

1.2. Background, Rationale and Value of the Study

Technological advancements are altering the way that societies around the world work. Digital networks and the data they generate are used in retail for different reasons, including to advertise their products, optimise demand, as a modern way to target specific customers and to penetrate new markets (Goga et al., 2019). These developments have a significant impact on how companies work and on different sectors and supply chains in the South African economy (Arndt et al., 2020).

Online retail is a retail industry sector that includes the sale of physical products through collection and delivery to customers using online stores (Mitchell, 2021). Over the last decade, the online retail industry in South Africa has expanded exponentially in scale and value, with an estimated contribution of 1.5% to the overall retail trade in the year 2019 (Bekker, 2020). In South Africa, a total of 2,825,000 individuals are employed in the retail and wholesale industries, which accounts for 22% of the national workforce (Promozione, 2015).

This study focuses on online retailing in the FMCG (Fast Moving Consumer Goods) markets. Mitchell (2021) defines FMCG as goods that sell effortlessly at a low price, having a minimal shelf life owing to high demand from consumers. Colen et al. (2020) posit that FMCG is primarily connected to the agricultural industry and food manufacturers that serve as primary suppliers and to the transport and logistics industry. Retailers have begun to consolidate sourcing and logistics into their core sector and have invested massively in their central warehousing and transportation resources to streamline operations and cut costs. They are also increasing their reliance on technology in an effort to understand their client base better and improve performance (Mitchell, 2021).

1.3. Research Aim, Objective, and Questions

1.3.1. Research Aim

This study explores the challenges faced by 3PL companies regarding their Key Performance Indicators in the online FMCG sector of the retail industry in South Africa during the Covid-19 global pandemic.

1.3.2. Research Objective

The objective of the study is to assess the extent of the global pandemic's impact on the 3PL's Key Performance Indicators (KPIs) in South Africa.

1.3.3. Research Questions

The study aims to answer the research question related to its objectives, it aims to assess the impact of the global pandemic on the 3PL's operations in South Africa, using their Key Performance Indicators (KPIs) as a yardstick. Therefore, the research question being answered through this study is: How has the global pandemic affected the Key Performance Indicators (KPIs) of 3PLs in South Africa?

1.4. Scope and Limitations of the Study

This study explored the online retail industry in South Africa with a focus on third-party logistics companies in the Gauteng Province. The study investigated the global pandemic's impact on 3PL's operations in the retail industry in South Africa.

The study is limited to 3PL companies in Gauteng Province, South Africa. The study methodology involved the use of questionnaires, which were arranged into segments and given to the respondents in the selected 3PL companies in Gauteng, South Africa. This means that the study may not prove generalisable to 3PL companies nationwide and globally. Also, performing on-site visits to collect data directly from the company was difficult owing to the restrictions introduced to curtail the pandemic; therefore, distributing questionnaires online was considered sufficient.

2. Literature Review

South Africa is the most developed country on the African continent with respect to the 3PL market; logistics expenditure, which accounts for "11.8 percent of South Africa's gross domestic product", emphasises this point (Nel, De Goede and Niemann, 2018). The 3PL industry in South Africa is made quite fallible by high freight transport expenses. However, when it comes to logistics outsourcing, South Africa is also one of the most developed countries in Africa, as logistics outsourcing acts as a strategic resource for the South African economy and is critical in delivering a worldwide competitive advantage (Meyer et al., 2019). According to Havenga (2018), many logistics activities are undertaken by 3PL service providers, which follows the global trend of outsourcing logistics-management services. Some of the 3PL providers include Transnet, Fastway, Takealot and Barloworld. Most industries, including IT, automotive FMCG and pharmaceuticals, outsource their logistics services to 3PL providers (Karrapan et al., 2017).

2.1 Third Party Logistics

The term "third-party logistics", or 3PL, refers to subcontracting an external service provider to deal with shipments, warehousing and other logistics-related activities initially carried out in-house, according to Mengistu (2016). By making use of logistics-outsourcing practices, corporations can concentrate on their core market processes. This results in benefits such as cost savings, improved delivery consistency and increased customer loyalty.

According to Chitta (2017), 3PL relates to the transport service provider, perceived as a third party rather than as a retailer or a consumer, as depicted in Figure 1 below. The goods or services are shipped to the final consumer from the manufacturer through the retailer.

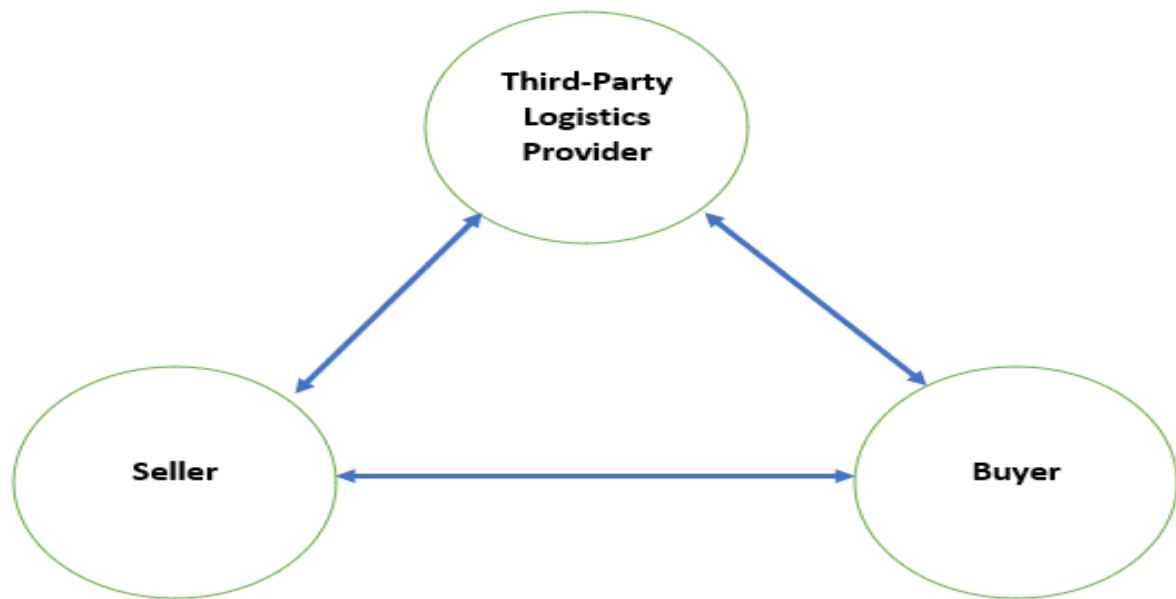


Figure 1: Relationship between the third-party logistics provider, the seller and the consumer
 Source: Adapted from Chitta (2017).

2.2 Pandemic Risks on the 3PL Companies' Operations

The impact of COVID-19 has had both social and economic repercussions, resulting in a lockdown across the entire country and the termination of businesses and ways of making a living. Labor interruptions brought on by lockdowns and the need to cut staff to maintain social distance policies as recommended by the Centres for Disease Control were two of the most major challenges that warehouses had to deal with (Erhie, Nevin and Osinubi, 2020). Additionally, as stated by Butt (2021), some businesses have laid off most of their staff because of a lack of supply and demand to maintain their operational expenditures, and some business executives have proven that they are willing to invest more money if it means ensuring consistent service levels. As such, logistics companies may need to get used to spending more to keep up with customer demands.

Furthermore, quite a number of workers have been killed by the virus, while majority of the workers have been placed in quarantine as a result of their exposure to the disease, the remainder of the population decided against leaving their homes out of fear for their lives (Guan et al., 2020). As a result, logistics and delivery of goods have been limited by workforce shortage at the manufacturing and supply level. The difficulties that logistics firms have encountered because of the COVID-19 Pandemic are merely another barrier to be breached. However, their success will rely on their ability to adapt to new situations and circumstances.

2.3 PL Key Performance Indicators

Lu et al. (2019) state that performance measurement is an important technique in supply-chain management for evaluating internal performance and supply-chain partners. It is a useful approach for keeping track of the success of specific activities along with assessing organisational behaviour, which

helps the company to meet its strategic objectives (Pavlov et al., 2017). A performance indicator is a set of measurements used to assess the efficiency of an action. They can also be defined as tangible quantities used to compare and control the overall performance of a company (Piela, 2017).

The performance indicator can be used to determine the level of 3PL success and identify corrective actions in the event of service failures (Bressolles and Lang, 2019). These key performance indicators being suggested are: (1) Safety, (2) Delivery time, (3) Inventory accuracy, (4) Warehouse capacity, (5) Workforce turnover, (6) Pickup accuracy, (7) Simplicity of online order forms, and (8) Customer satisfaction (Bressolles and Lang, 2019).

2.4 Measures Mitigating Risks on Supply Chain Disruption

The literature on measures that can be used to mitigate the risks on supply-chain disruption is well documented. This is evidenced in both Tables 1a and 1b below. It is important to note that, for the purpose of this study, the authors have chosen to refer to COVID-19 as C-19 in both Tables 1a and 1b.

Table 1a: Literature Review on Measures to Mitigate Risks on Supply Chain Disruption

Author	Problem Investigated	Methodology Followed	Future Studies	Location
Smith (2022)	Shortage of drivers and autonomous vehicle in the logistics industry in the USA	Case study	Expand the study to larger sample.	USA, America
Ortiz-Barrios et al. (2021)	The C-19 pandemic's adverse effects on the readiness state of sales divisions in the electrical appliance sector.	Studies from the documented literature and case studies	Consider cross-country studies for comparative analysis.	Colombia, America
Rinaldi and Bottani (2023)	C-19 impact on Italian logistics and supply chains in 5 sectors: food, machinery, metal, logistics, textile.	The investigation used 82 replies to a questionnaire to examine how C-19 affects firms.	Consider other sectors to expand and generalize the analysis for additional insights.	Italy, Europe
Syahmi, Hutaaruk and Kumiawan (2020)	A drop in distribution rate performance that is not in accordance with the company's aim for shipping shipments.	A technique for describing the features of the pandemic phenomena.	Explore different contexts and disruption periods.	Indonesia, Asia
Vanany et al. (2021)	Absence of theoretical reference knowledge of SC skills and robustness revealed by C-19 pandemic	Four instances in the mineral water and pharma sectors.	Strengthen the validation of the proposed framework through more cases.	Indonesia, Asia
Montoya-Torres, Muñoz-Villamizar and Mejia-Argueta (2021)	Lack of framework to counter supply chain disruptions.	Comprehensive analysis of the body of work in peer-reviewed publications from 2020.	Investigation using diverse qualitative and quantitative techniques.	Global
Ashraf et al. (2021)	During the C-19, there were paradoxes in the 3PL activities.	A questionnaire to find ambiguities in US 3PLs was utilized in conjunction with in-depth individual interviews.	Investigate 3PLs in different countries/continents for diverse paradoxes and management approaches.	USA, America
Butt (2021a)	The actions and remedies taken by purchasing and distribution companies to overcome supply chain interruptions caused by C-19.	Senior executives from nine supply chain companies were interviewed for the purpose of a case study.	Further exploration of "New Normal" mitigation strategies for disruptions.	China, Pakistan, Sri Lanka and India, Asia

Gultekin et al. (2022)	Unknowns and hazards have a significant part in developing risks for logistics operations throughout the C-19 pandemic.	A combination of qualitative work and the fuzzy DEMATEL method.	Evaluating LSPs' shortcomings and strengths both now and in the future to help them prepare for any potential crisis.	Turkey, Europe
Kumar et al. (2021)	Perishable food supply chains (PFSC) operations' dangers and weaknesses amid the C-19 pandemic.	A combination of qualitative work and the contingency theory using the fuzzy best worst method.	Exploring PFSC with developing economic perspectives, and utilizing hybrid research methodologies	India, Asia
Özcan and Yumurtacı Hüseyinoğlu (2023)	Uncertainty sources confronted by 3PLs operations disruptions during the C-19 pandemic	The study draws upon Resource Orchestration Theory (ROT).	Compare regions' strategies in managing 3PLs and empirical practices.	Turkey, Europe
German et al. (2022)	In the context of the C-19 epidemic, the study investigates the variables that influence customer intention when choosing a 3PL supplier.	This research utilizes ANN and Random Forest to validate 3PL selection factors during C-19.	Future research can explore advanced algorithms for studying human behaviour.	Philippines, Asia
Sudan and Taggar (2021)	Indian firms' COVID-19 countermeasures against supply chain disruptions were studied.	Literature review on supply chain disruptions and transportation, including pandemics.	Expand the study to larger sample	India, Asia

Table 1b: Literature Review on Measures to Mitigate Risks on Supply Chain Disruption

Author	Problem Investigated	Methodology Followed	Future Studies	Location
Mishra, Singh and Subramanian (2021)	Chain of supply adaptability in an agri-food company during the C-19 epidemic.	Dynamic capability theory applied to agri-food supply chain for resilience framework.	Explore supply chain resilience and dynamic capability through rigorous data analysis.	India, Asia
Hossain, Thakur and Kazancoglu (2022)	Analyze drivers of resilient HCSC preparedness during health outbreaks in India.	Use Grey clustering to analyze resilient HCSC drivers during outbreaks based on Grey-Delphi, AHP, and IE theory.	Validate drivers through large-scale study, use advanced techniques for accurate weight calculations.	India, Asia
Nand et al. (2023)	Identification and analysis of the drivers of emerging technologies implementation in logistics in the Australian context	3-phase study: interviews with Australian logistics stakeholders, interviews during C-19, focus group discussion.	Enhance diversity, compare diffusion, explore service sector, examine country factors, mix methods for holistic research.	Australia, Australia
Jorge Ayala Cruz (2023)	Risk management strategies and effectiveness of Puerto Rican manufacturing clusters during 2016-2020, including C-19 pandemic.	Survey, interviews, and secondary sources used for manufacturing cluster research.	Future research should explore cluster strategies in complementing risk management.	Puerto Rico, America
Timotius et al. (2023)	Based on their online buying insights, this study investigates how online customers and sellers value choosing a courier service.	Consumer preferences and seller viewpoints were acquired through a focus group. Variables in a survey were ranked according to Kansei Engineering principles.	Analyse consumer and seller perspectives on courier service selection across locations, demographics, objectives for improved outcomes.	Indonesia, Asia

Perano et al. (2023)	Identify areas of supply chain management for DT implementation.	Systematic review analysed DTs' impact on SC management.	Assessing the rise of new practices based on DTs across time.	Global
Vivaldini (2023)	The impact of logistical urgency on the operations of logistics suppliers.	Systematic review analysed recent academic articles on logistical outsourcing.	Expand the scope of the systematic research review to more database than just SCOPUS	Global
Akhtar, Gunasekaran and Kayikci (2023)	Due to the many factors and options, choosing a global manufacturing outsourcing partner is difficult and unclear.	Identified four selection criteria with 16 sub-criteria. SF method used to address rating variability by DMs.	Grow the variety of DMs from shoemakers and emerging nations, and expand the quality and quantitative standards.	India, Asia

2.5 Measures for Mitigating the Pandemic Risks on 3PL

The following risk reduction measures can be used to effectively manage the pandemic risks associated with 3PL:

1. A type of autonomous employee self-service platform known as a "Chatbot" or "Digital HR Assistant" may be integrated with the systems used by employees of the company, allowing them to schedule paid or unpaid time off, reschedule or cancel meetings, and automatically notify co-workers or customers of the changes they make (Lawler and Boudreau, 2015). As a result, managers can focus on duties that add value to their work and be freed up from routine tasks. Other employees can also concentrate on areas of their work that create value.
2. According to Glistau and Coello Machado (2019), an Automated Guided Vehicle (AGV) uses a variety of technical solutions to accomplish the same goal of moving, handling and transporting without a driver or pilot. These vehicles provide a significant opportunity to boost space and transportation capacity as well as energy efficiency. Vehicles with sensors for direction, speed and safety distances include smart cars, vans, lorries, and buses. Cameras have taken the place of traditional rear-view mirrors, and information concerning topographical properties is provided by GPS and Wireless Local Area Network (WLAN). The newest versions of AGVs and mobile robots are equipped with additional sensors, allowing them to gather more data, drive independently and interact with one another. They can independently navigate to the locations where they are required. They provide support for activities such as transportation and delivery, assembly, quality control and maintenance, as well as the handling of tools (Glistau and Coello Machado, 2019).
3. Big data is an equally important tool in the reduction of risks in the 3PL industry. A logistics provider can create a rhythmic and continuous operation of its warehouse using data about the placement of items, peak loading and unloading hours, and vehicle movement inside the warehouse. This has the effect of limiting the downtime of staff and equipment and dispersing the load throughout the day (Raj et al., 2022).

3. Research Methodology

3.1 Research Design

This study took a descriptive quantitative approach to examine the impact of the global pandemic on the Key Performance Indicators (KPIs) of 3PL providers in South Africa. The aim was to gather objective data that could be easily conveyed through numbers, allowing for a clear understanding of the situation. To achieve this, the researchers employed a survey research strategy using structured questionnaires.

By collecting and analysing data through this quantitative approach, the study aimed to determine the extent to which the pandemic affected various KPIs within the 3PL industry. This method provided a solid foundation for assessing and communicating the findings, ensuring the objectivity of the study. Ultimately, the research aimed to shed light on the effects of the global pandemic on the performance of 3PL providers in South Africa, providing valuable insights into the industry's response to this unprecedented challenge.

3.2 Data Collection

In order to gather the necessary information for this study, carefully designed questionnaires were employed as survey tools. These questionnaires were thoughtfully crafted to capture the specific data points and insights required to explore the research objectives. The questionnaire was structured into five sections: (A) Background Information, (B) Pandemic Risks, (C) Performance Indicators and (D) Mitigating Strategies. It is important to note that Sections B to D utilized a five-point Likert scale for rating responses. The scale ranged from 1 ("Not at all") to 5 ("Extremely"). Clear instructions were provided to guide respondents in answering the questions.

To ensure a diverse and comprehensive sample, the questionnaires were distributed through multiple channels. Participants had the option to complete the questionnaires either in person or electronically using a convenient Google Form web link. This approach aimed to maximize accessibility and convenience for the participants, allowing them to choose the response method that best suited their preferences and circumstances.

The use of both in-person and electronic distribution methods provided flexibility and ease of participation, accommodating a wide range of individuals, and ensuring a robust dataset for analysis. By utilizing a digital platform like Google Forms, the study streamlined the data collection process, enabling quick and efficient collection of responses.

Once the questionnaires were completed, the data was carefully gathered and prepared for analysis. By leveraging various statistical and analytical techniques, the collected data would be explored and interpreted to extract meaningful insights. The combination of in-person and electronic questionnaire distribution methods offered a well-rounded approach to data collection, enabling a comprehensive examination of the research topic.

Through this meticulous and thoughtful approach to survey design and distribution, the study aimed to gather accurate and reliable information that would serve as the foundation for insightful analysis and meaningful conclusions.

3.3 Population and Sampling

The target population was the top-level managers, directors, heads of departments, warehouse managers, and the courier/ delivery personnel of selected 3PL companies in the Cargo Handling, Storage and Warehousing and Online retail industries in the Gauteng province in South Africa. These companies were extracted explicitly from the latest industry reports, the Online Retail Industry in South Africa and the Cargo Handling, Storage and Warehousing, based on the size of their workforce, published by the African Business Information, sourced from the UJ Library Database. The target population in these companies was chosen due to their knowledge, experience, and direct involvement in their respective companies' logistics, warehousing, and retail operations.

The random sampling method was used for this study because it allows for each component of the target population to enter the sample, with selections that are independent of one another. This method also provides an equal chance of selection for any sample combination. The research participants were sampled using this method, with the criterion that they should be a manager, director, head of department, warehouse manager or courier/delivery personnel.

The sample size is an important aspect of research, determining the accuracy of results. It represents the total number of participants in the study and is divided into demographic groups to ensure representation of the entire population (Taherdoost, 2018). A larger sample size reduces the probability of error in generalizing findings, according to Marshall et al. (2013). In this study, financial and logistical constraints made it impractical to survey the entire population, so a representative sample of 171 participants was chosen from a population of 300 employees. This sample size was determined using the formula $n = \frac{N}{(1+N(e^2))}$, where N is the population size and e is the error tolerance of 0.05% (Singh and Masuku, 2014).

3.4 Reliability

Reliability refers to the ability of measurement instruments to produce consistent results when used repeatedly (Surucu & Masla, 2020). Cronbach's Alpha coefficient is a widely used method to evaluate the consistency and reliability of Likert-scale questions, as stated by Heale and Twycross (2015). Surucu and Masla (2020) provide a guiding principle related to Cronbach's Alpha coefficient, as set out in Table 2 below.

Table 2: Cronbach’s Alpha coefficient

Cronbach’s Alpha Coefficient	Interpretation of the Cronbach’s Alpha Coefficient
$\alpha \geq 0.9$	The scale has a high level of internal coherence.
$0.7 \leq \alpha < 0.9$	The scale is reliable internally.
$0.6 \leq \alpha < 0.7$	The scale's internal coherence is fair.
$0.5 \leq \alpha < 0.6$	The scale's internal coherence is poor.
$\alpha \leq 0.5$	There is no internal coherence in the scale.

Table 3 below displays the findings of the internal consistency for Sections B, C and D of the questionnaire.

Table 3: Cronbach’s Alpha coefficient

Sections	Category	Cronbach’s Alpha
Section B	Pandemic Risks	0.760
Section C	Performance Indicators	0.725
Section D	Mitigating Strategies	0.795

The study found that all the variables from each category presented above had Cronbach's Alpha values that were higher than 0.7, which indicated that the study was consistent in measuring the same variables and that the results were reliable.

3.5 Ethical Considerations

Having received ethical clearance from the Faculty of Engineering and the Built Environment's Ethics and Plagiarism Committee (Ethical Clearance Number: UJ_FEBC_FEPC_00515), potential participants were informed about the study and provided with a consent letter to seek their voluntary participation. Participants were assured that their information would be treated confidentially and accessed only by the researcher and academic supervisors involved in the study. Prior to completing the questionnaire, participants were given a consent letter that emphasized their right to withdraw from the survey at any time. It is important to highlight that participants were not obligated to disclose personal details, ensuring that the final data analysis maintains confidentiality and excludes any identifying information, such as names

4. Results and Findings

4.1 Description of the Study Participants

Based on the data collected from the questionnaires, it was found that the majority of participants in the study were male (57%), with the remaining participants being female (43%). Additionally, it was observed that most of the participants fell within the age range of 31 to 35 years old. These findings indicate that the retail industry has a relatively lower representation of senior workers with extensive experience.

Furthermore, when considering the participants' years of experience, it was discovered that more than half of the respondents (53.3%) had zero to five years of experience. This suggests that a significant portion of the participants were newcomers to the field, with an average of five years of experience, implying that they still had much to learn and grow in their careers.

4.2 Pandemic Risks

Table 4 presents the rankings assigned by respondents, indicating the perceived impact of pandemic risks on the operational performance of 3PLs within the retail industry.

Table 4: Pandemic Risks Statistics

Pandemic Risks	Mean	Standard Deviation	Range
Revenue from sales going down	3.71	0.715	1
Additional cost being required	3.68	0.686	2
Productivity is lost	3.68	0.817	3
Income is lost	3.68	0.817	4
Decrease in the pool of potential employees	3.57	0.706	5
Accident leading to injury of staff	2.63	1.079	6

Among the identified risks, "Revenue from sales going down" emerged as the highest-ranked concern, with a mean score of 3.71 and a standard deviation of 0.715. This highlights the significant impact that the pandemic had on the financial performance of 3PLs, reflecting the challenges they faced in maintaining sales levels amidst the crisis.

On the other hand, "Accident leading to injury of staff" ranked sixth in terms of perceived impact, with a mean score of 2.63 and a standard deviation of 1.079. This indicates that while personal injury was acknowledged as a risk, it was not considered as severe or prevalent as other identified risks. The relatively higher standard deviation suggests some variation in respondents' perceptions regarding the extent of personal injury's impact on 3PL operations.

4.3 Impact of the Pandemic Risks on the 3PL's Key Performance Indicators

Table 5 provides valuable insights into the rankings assigned by respondents, highlighting their perception of the impact of pandemic risks on the key performance indicators (KPIs) of 3PLs. Among the identified risks, "Workforce yield" emerged as the highest-ranked concern, receiving a mean score of 3.62 and a standard deviation of 0.708. This indicates that respondents recognized the significant impact that the pandemic had on the turnover rate of the 3PL workforce. The relatively low standard deviation suggests a certain level of agreement among respondents regarding the magnitude of this impact.

Table 5: Impact of the Pandemic Risks on 3PL's Key Performance Indicators Statistics

Performance Indicators	Mean	Standard Deviation	Range
Workforce yield	3.62	0.708	1
Time taken to deliver	3.60	0.684	2
Collection is accurately done	3.56	0.698	3
Stock is accurately recorded	3.52	0.663	4
Depot capacity	3.51	0.718	5

In contrast, "Depot Capacity" ranked fifth in terms of perceived impact, with a mean score of 3.51 and a standard deviation of 0.718. This suggests that while respondents acknowledged the effect of the pandemic on warehouse capacity, it was not viewed as the most critical factor influencing 3PL performance during the crisis. The standard deviation implies some variability in respondents' opinions about the extent of this impact on warehouse capacity.

4.4 Mitigating Strategies

In Table 6, we can gain valuable insights into the rankings provided by the respondents, which shed light on the effectiveness of various mitigation strategies employed by 3PL companies to minimize the impact of the global pandemic risk. Among the identified strategies, "Utilizing IoT technology to store goods near points of consumption in order to enhance turnaround time" emerged as the top-ranked approach, receiving a mean score of 3.77 and a standard deviation of 0.656. This indicates that respondents recognized the significance of leveraging IoT technology to optimize the location of goods and improve turnaround time, thus enhancing operational efficiency and meeting customer demands more effectively. The relatively low standard deviation suggests a certain level of consensus among respondents regarding the effectiveness of this strategy.

On the other hand, "Implementing digital assistants such as chatbots to allow employees to focus on more important tasks" ranked sixth in terms of effectiveness, with a mean score of 3.32 and a standard deviation of 0.804. This suggests that while respondents acknowledged the potential benefits of digital assistants in relieving employees of mundane tasks and allowing them to focus on more critical responsibilities, it was not perceived as the most impactful mitigation strategy. The higher standard deviation implies some variability in respondents' opinions about the effectiveness of this approach.

Table 6: Mitigating Strategies Statistics

Variables	Mean	Standard Deviation	Variance
Using IoT technology to store commodities close to where they will be consumed to speed up turnaround	3.77	0.656	1
The use of IoT technology for warehouse management	3.74	0.694	2
Using IoT solutions to manage fleet and transportation operations cost- and time-effectively	3.64	0.705	3

Analysing customer purchase behaviour with big data analytics to improve demand forecasting	3.56	0.671	4
Automating processes to reduce the need for physical labour	3.33	0.807	5
Using chatbots and other digital helpers will free up staff members' attention for more crucial activities.	3.32	0.804	6

5. Discussion

The findings presented in Section 4 of the study shed light on various aspects related to the impact of the pandemic on 3PLs in the retail industry. The discussion focused on three key areas: pandemic risks, their impact on key performance indicators (KPIs), and the effectiveness of mitigating strategies.

Regarding pandemic risks, the findings revealed the specific risks that were perceived to have the greatest and least impact on the operational performance of 3PLs. This highlights the importance of addressing and managing these risks to ensure the resilience and effectiveness of 3PL operations during challenging times.

The impact of the pandemic risks on the 3PLs' KPIs was another important aspect examined in the study. The findings provided insights into the KPIs that were most and least affected according to the respondents. Workforce turnover emerged as a major concern, underscoring the challenges faced by 3PLs in retaining and managing their workforce during the crisis. The attention given to warehouse capacity also indicates the need for effective capacity management strategies to ensure smooth operations and meet customer demands.

The study also explored the effectiveness of various mitigating strategies employed by 3PLs to combat the challenges posed by the global pandemic risk. The findings highlighted the prominence of utilizing IoT technology to optimize the storage and location of goods, showcasing its potential to enhance operational performance and customer satisfaction. Leveraging IoT enables 3PL companies to streamline processes, reduce transportation time, and improve overall supply chain efficiency. Additionally, the inclusion of digital assistants, such as chatbots, was identified as a potential contributor to operational improvements, allowing employees to focus on more value-added tasks.

In conclusion, the study's findings provide valuable insights for 3PLs in the retail industry to navigate the challenges brought about by the pandemic. Addressing specific risks, managing key performance indicators, and implementing effective mitigation strategies are crucial for ensuring operational resilience and success in an ever-changing landscape. By leveraging these insights, 3PL companies can adapt and thrive in the face of disruptions, enhancing their overall performance and customer satisfaction.

6. Managerial Implications

The findings of the study have important managerial implications for 3PL companies operating in the retail industry.

Firstly, the study emphasizes the significance of addressing and managing the specific risks perceived to have the greatest impact on 3PL operational performance during the pandemic. Managers should prioritize these risks and implement robust risk management strategies to ensure the resilience and effectiveness of their operations in challenging circumstances.

Furthermore, the study provides valuable insights into the specific Key Performance Indicators (KPIs) that were most affected by the pandemic risks according to the respondents. The prominence of workforce turnover as a top concern highlights the challenges faced by 3PLs in retaining and managing their workforce during the crisis. Managers should focus on strategies to retain and engage employees, such as offering competitive compensation, providing training and development opportunities, and fostering a supportive work environment. Additionally, the attention given to warehouse capacity suggests the need for effective capacity management strategies to ensure uninterrupted operations and meet customer demands.

The findings also shed light on the mitigation strategies perceived to be most effective in combating the challenges posed by the global pandemic risk. Leveraging IoT technology to optimize the storage and location of goods emerged as a prominent strategy, with the potential to enhance operational performance and customer satisfaction. Managers should explore opportunities to incorporate IoT solutions into their operations, streamlining processes and reducing transportation time. Additionally, the inclusion of digital assistants, such as chatbots, can contribute to operational improvements by automating routine tasks and allowing employees to focus on more value-added activities.

Overall, the study underscores the importance of continuous improvement and adaptation in the face of challenges. Managers should regularly assess the effectiveness of their strategies and operations, seeking feedback from customers, employees, and other stakeholders. This ongoing evaluation enables 3PL companies to identify areas for improvement, drive innovation, and maintain competitiveness in a dynamic business environment.

7. Conclusions, Limitations and Future Research

The literature reviewed for the study revealed that regarding the pandemic risks, a decrease in sales revenue, requirement of additional cost, productivity loss, loss of income, workforce shortage and personal injury had the highest impact on the operational performance of 3PL companies. In line with these findings, “Workforce Turnover” was highest ranked according to the level at which the 3PLs have been affected by pandemic risk in the retail industry, with “Warehouse Capacity” the lowest ranked KPI. The result indicated that 3PL operations in South Africa were greatly affected by the pandemic.

The low workforce turnout identified by the respondents is consistent with a review by Guan et al. (2020) that found that at the peak of the pandemic the majority of workers were placed under quarantine as a result of their exposure to the disease, while the remainder of the population decided against leaving their homes out of fear for their lives.

Results from findings also revealed that the ways in which 3PL companies in South Africa can use Logistics 4.0 to mitigate the risks posed by the global pandemic to the retail industry operation include the implementation of IoT technologies in warehouse management, which can improve turnaround time by keeping goods stored near points of consumption. Additionally, utilising IoT for transport and fleet management can decrease costs and save time. By analysing consumer-purchasing patterns through big data analytics, demand forecasting can be enhanced. Automation can also be employed to decrease manual labour, and the incorporation of digital assistants such as chatbots can allow employees to focus on more important tasks.

This study encountered certain limitations, which provide directions for future research. The frequency of supply-chain interruptions found in this study could be investigated using the mixed-methods approach in subsequent studies, to further elucidate quantitative findings. This would allow researchers to determine whether the majority of supply-chain disruptions arise within or across organisations.

This study's scope was restricted to 3PL providers with businesses based in Gauteng Province, South Africa. A study of other industries and organisations where 3PL services are not used will determine if the findings in this study are appropriate for this geographic context, particularly in South Africa.

In line with the study's restricted geographical scope, to assess the applicability of the findings further, this study might be repeated in various regions of Africa, such as West Africa and East Africa. The study outcomes from the various regions could then be contrasted to determine the variations in supply-chain interruptions across the continent. Multinational corporations operating in Africa may benefit from this as they will be able to concentrate managerial efforts where they are most required.

This study was only able to provide a high-level overview of how 3PLs and their clients situated in the South African's province of Gauteng manage disruptions to the supply chain. However, future research may be able to provide a more in-depth examination of disruption management and seek to identify best practice in this context while comparing those findings to the ones provided by this study.

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