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The Impact of the Covid-19 Pandemic on Supply Chains (an Applied Study on the Industrial Sector in the Kingdom of Saudi Arabia - the Packaging Sector)

Dr. Abdulrahman Mesfer Aljuaid

DBA in Business Administration, College of Business Administration, University of Lincoln, Malaysia

Email: Juaidam@wataniaind.com

Dr. Mohamed Anas Shamsy

PhD in Business Administration, University of Bourgogne, Dijon, France

Dr. Abhijit Ghosh

DBA in Business Administration, College of Business Administration, University of Lincoln, Malaysia

Abstract:

The COVID-19 pandemic has had a profound and ongoing impact on supply chains, affecting various aspects such as restrictions on movement, transportation methods, and the challenges of producing goods and services due to the virus's impact on human resources. Addressing these supply chain disruptions is crucial to ensure the smooth operation of global supply chains, supporting societies and commerce. Hence, the current study aims to examine the influence of the pandemic on raw materials in packaging plants in KSA and shed light on its impact on supply chains in those facilities, specifically the availability of spare parts. The study holds significance from both theoretical and practical perspectives. Theoretical importance lies in contributing to existing research by exploring the variables and their interrelationships, highlighting the significance of the selected sample, and paving the way for future related studies. On the practical side, the study's findings are valuable for developing strategies and solutions to prevent similar disruptions in the future. The study concludes that the COVID-19 pandemic has prompted companies to embrace a technology-driven work culture, optimize resource utilization, and expand the adoption of remote work practices. Additionally, the focus is on fostering mutually beneficial relationships with suppliers,

ensuring flexible production and supply processes, incorporating local and international specifications into products, accommodating customer preferences, and striving to deliver high-quality and efficient products that meet customer demands.

Keywords: COVID-19 Pandemic, Supply Chains, Raw Materials, Packaging Plants, Future Research, Strategies.

تأثير وباء كوفيد - 19 على سلاسل التوريد (دراسة تطبيقية على القطاع الصناعي في المملكة العربية السعودية - قطاع التعبئة والتغليف)

الدكتور/ عبد الرحمن مسفر الجعيد

دكتوراه في إدارة الأعمال، كلية إدارة الأعمال، جامعة لينكولن، ماليزيا

Email: Juaidam@wataniaind.com

الدكتور/ محمد أنس شمسي

دكتوراه في إدارة الأعمال، جامعة بورغوني، ديجون فرنسا

الدكتور/ ابهيجيت غوش

دكتوراه في إدارة الأعمال، كلية إدارة الأعمال، جامعة لينكولن، ماليزيا

الملخص:

تأثرت سلاسل التوريد بشكل عميق ومستمر بسبب جائحة كوفيد-19، حيث تأثرت العديد من الجوانب مثل قيود الحركة، وطرق النقل، والتحديات التي تواجه إنتاج السلع والخدمات بسبب تأثير الفيروس على الموارد البشرية. من الضروري معالجة هذه الاضطرابات في سلاسل التوريد لضمان سلس تشغيل السلاسل التوريد العالمية ودعم المجتمعات والتجارة. وبناءً على ذلك، يهدف الدراسة الحالية إلى فحص تأثير الجائحة على المواد الخام في مصانع التعبئة والتغليف في المملكة العربية السعودية وتسليط الضوء على تأثيرها على سلاسل التوريد في تلك المرافق، وتحديدًا توفر قطع الغيار. تحمل الدراسة أهمية نظرية وعملية؛ حيث تسهم في إثراء البحث الحالي من خلال استكشاف المتغيرات وعلاقاتها المتبادلة، وتسليط الضوء على أهمية العينة المحددة وتمهيد الطريق للدراسات المستقبلية ذات الصلة.

ومن الجانب العملي، تعتبر نتائج الدراسة قيمة لوضع استراتيجيات وحلول لمنع حدوث اضطرابات مماثلة في المستقبل. تستنتج الدراسة أن جائحة كوفيد-19 دفعت الشركات إلى اعتماد ثقافة عمل مدفوعة بالتكنولوجيا، وتحسين استخدام الموارد، وتوسيع اعتماد ممارسات العمل عن بُعد. بالإضافة إلى ذلك، يتم التركيز على تعزيز العلاقات المفيدة للجانبين مع الموردين، وضمان عمليات إنتاج وتوريد مرنة، ودمج المواصفات المحلية والعالمية في المنتجات، وتلبية تفضيلات العملاء، والسعي لتقديم منتجات عالية الجودة وفعالة تلبي احتياجات العملاء.

الكلمات المفتاحية: جائحة كوفيد-19، سلاسل التوريد، المواد الخام، مصانع التعبئة والتغليف، بحوث مستقبلية، استراتيجيات.

1. Introduction

The introduction highlights the unprecedented COVID-19 pandemic that occurred in 2020 and its global impact on various sectors, including supply chains. China's role as a major manufacturing and distribution center caused disruptions in global trade (Selmi and Bouoiyour, 2020; Ahani and Nilashi, 2020). The pandemic led to a significant economic slowdown, affecting production systems, supply chains, and foreign trade. The containment measures and restrictions imposed by governments further hindered supply chains, causing disruptions in the flow of raw materials and manufacturing processes. The changes brought by the pandemic affected every aspect of the product supply chain, including variations in demand, price increases, and raw material shortages. The packaging industry in Saudi Arabia, heavily reliant on imported raw materials, was particularly affected. Good packaging is crucial for product competitiveness and consumer perception.

1.1. Problem of the Study

This study aims to address the impact of the Covid-19 pandemic on supply chains in the packaging sector of the Kingdom of Saudi Arabia. The researcher observed the significant effects of the pandemic on the global economy, including production systems and supply chains. However, there is a gap in the existing literature regarding the specific impact on the packaging industry in Saudi Arabia and the relationship between the pandemic and supply chains in this sector. Therefore, the focus of this study is to investigate and understand the implications of the Covid-19 pandemic on the supply chains of packaging factories in Saudi Arabia.

1.2. Significance of the Study

This study is significant both theoretically and practically. Theoretically, it adds to the existing knowledge by examining the relationship between the variables of interest and expanding understanding in the specific context of the packaging sector in the Kingdom of Saudi Arabia. This research sets the stage for future studies to delve deeper into the topic. Practically, the study has practical implications as it provides insights into the actual impact of the Covid-19 pandemic on supply chains in the packaging sector. These findings can inform the development of strategies and plans to address similar disruptions in the future, enhancing the resilience and efficiency of the packaging industry.

1.3. Hypothesis of the Study

The hypothesis of this study, formulated in the null form, is as follows:

- There is a statistically significant impact of the Covid-19 pandemic on the supply chains of packaging factories in the Kingdom of Saudi Arabia.
- There is a statistically significant effect of the Covid-19 pandemic on the availability of raw materials in packaging factories in the Kingdom of Saudi Arabia.
- There is a statistically significant effect of the Covid-19 pandemic on the availability of spare parts in packaging factories in the Kingdom of Saudi Arabia.

1.4. Study Form

The study investigates the relationship between two variables: the independent variable, which is the COVID-19 pandemic, and the dependent variable, which is supply chains. Additionally, the study considers a range of demographic variables.

1.5. The Limits of the Study

This study focuses on the time period from 2022 to 2023 and specifically examines the manufacturing industries in Saudi Arabia (KSA) as its spatial limits.

1.6. Definitions of Study

- **COVID-19 pandemic**: The COVID-19 pandemic refers to the global outbreak of the novel coronavirus disease caused by the SARS-CoV-2 virus. It was first identified in December 2019 in Wuhan, China, and has since spread worldwide, leading to significant illness and death rates (ECDC, 2020; Lai et al., 2020).
- **Supply chain**: A supply chain is a network of interconnected organizations that collaborate to control, manage, and optimize the flow of materials and exchange of information from suppliers to end users (Christopher, Peck, 2015). It encompasses various activities such as procurement, storage, transportation, packaging, sales, and distribution, along with the associated physical infrastructure and operational processes (Iyer, 2011; Mentzer et al., 2001).
- **Packaging factories in Saudi Arabia**: These are manufacturing facilities located in the Kingdom of Saudi Arabia that specialize in the production of packaging materials. The packaging system involves a series of stages through which raw materials, supplies,

commodities, and their components pass from different production sources until they reach the end consumer, including trading operations.

2. Literature Review

2.1. Theoretical Framework

2.1.1. The COVID-19 Pandemic

The COVID-19 pandemic, caused by the SARS-CoV-2 virus, has rapidly spread across the globe, prompting countries to declare health emergencies. It is the first pandemic caused by a coronavirus and has had a profound impact on all sectors and individuals worldwide. The Americas have been particularly affected, with varying numbers of cases reported in different regions. The pandemic emerged in Wuhan, China, and quickly became a global crisis, with millions of infections and deaths recorded in numerous countries. COVID-19 is highly contagious and can cause a range of respiratory symptoms, with severe cases requiring medical attention. Preventive measures such as physical distancing, mask-wearing, and good hand hygiene, along with vaccination, are essential for preventing the virus's transmission. Despite efforts to reopen, many countries have faced challenges in containing the disease, emphasizing the need for collective action to combat its spread and mitigate its impact on public health and society.

The impact of the coronavirus on the world's industry: The COVID-19 pandemic has had varying impacts on businesses globally, with sales declining for many companies. Measures such as reduced working hours and wages were implemented to retain workers, while layoffs were less common. Digital solutions were embraced, but policy support was insufficient, particularly for smaller businesses and those in low-income countries. The pandemic has posed a threat to the global economy, causing market volatility and supply chain disruptions, with predicted losses lasting for years. Emerging economies have been hit hard, revealing existing vulnerabilities and increasing poverty and inequality. Smaller and informal businesses, as well as those with limited access to credit, have been most affected, especially in sectors like accommodation, food services, retail, and personal services.

2.1.2. Supply Chain

Traditionally, supply chain studies focused on the forward flow of materials and the reverse flow of information. However, there is now a growing interest in examining the performance, design, and analysis of the entire supply chain. This shift in perspective is driven by factors such as rising costs, limited resources, shorter product life cycles, increased competition, and globalization. One current area of interest is the integration of "reverse logistics," which involves the recovery of products for recycling, remanufacturing, and reuse, highlighting the importance of sustainability and product recovery in the supply chain. In manufacturing research, the concept of the supply chain has evolved from two-tier inventory models, and progress has been made in designing and analyzing two-tier systems. Previous works by Clark and Scarf have provided valuable insights and frameworks for understanding the dynamics of supply chains.

2.1.2.1. Definition of Supply Chain

Supply chains have been defined in various ways, encompassing different entities and activities. Definitions by Beamon, Chow and Heaver, Stevens, Christopher, and Behm highlight the involvement of multiple stakeholders in the process of delivering goods to customers. A supply chain includes manufacturers, suppliers, distributors, retailers, and logistics service providers Beamon B. (1998). It involves the flow of materials and information from suppliers to customers and generates value through product and service delivery. In the context of construction, Chow, D. and Heaver, T. (1999) the supply chain includes entities involved in building projects. Overall, a supply chain integrates the efforts of various business entities to acquire raw materials, convert them into finished products, and deliver them to retailers. It encompasses production planning, inventory control, distribution, and logistics processes. The production planning process manages manufacturing and storage activities Stevens (1989), while inventory control focuses on storage policies and procedures. The distribution and logistics process retrieves and transports products to retailers. These interconnected processes form an integrated supply chain that requires effective design and management to achieve desired performance outcomes.

2.1.2.2. The importance of supply chain decision

The success of a supply chain relies on effective design and management of product, information, and fund flows. Companies like Wal-Mart and Amazon excel in these areas, leading to their success.

Conversely, failures such as Web van and Borders can be attributed to weaknesses in supply chain design and adaptation. Dell Computer had to reassess its supply chain to meet changing technology and customer demands. In conclusion, prioritizing and optimizing supply chain design, planning, and operation contributes to success, while neglecting or failing to adapt can lead to setbacks and failures (Hofmann, E. 2013).

2.1.2.3. Supply Chain Management Defined

Supply chain management involves managing the activities within a supply chain, from sourcing raw materials to delivering finished products to end customers. It includes coordination, collaboration, and integration with suppliers, intermediaries, service providers, and customers. The goal of supply chain management is to deliver products, generate information, and add value to meet customer needs (Wisner, J. Tan, K. & Leong, G. 2014).

2.1.2.4. The Origins of Supply Chain Management in the U.S

In the mid-20th century, U.S. manufacturers focused on mass production techniques and large inventories. In the 1960s and 1970s, computer technologies led to the development of MRP and MRP II systems, improving materials management and reducing inventory costs. In the 1980s, supply chain management gained importance with the adoption of JIT and TQM strategies, emphasizing quality, efficiency, and collaborative relationships with suppliers. In the 1990s, manufacturers engaged with high-quality suppliers for improved service and cost savings. The evolution of supply chain management involved a shift towards strategic partnerships, efficient materials management, improved quality, and enhanced customer service. (Wisner, J. D., et al.2014).

2.1.2.5. Supply Chain and Supply Chain Management Theories

Supply Chains and General Systems Theory: Existing models of supply chain management are not fully developed or universally accepted, indicating a need for a different approach. Applying general theory principles could provide valuable insights for efficient supply chain management (Caddy and H.1999). Systems theory, as proposed by Ludwig von Bertalanffy's, emphasizes that systems can differ due to interactions between their components. The concept of determinable boundaries distinguishes a system from its environment. Yourdon E. adapted Miller's work to the information systems field, enhancing the understanding of information

systems. Applying Yourdon's research to supply chains could explore the existence and contribution of subsystems in supply chain development and management. Supply chains evolve over time, influenced by new technology, and the connections between organizations within the supply chain are expected to improve Ludwig von Bertalanffy (1969). General systems theory principles, such as complexity, adaptability, interconnectedness, and system development, can be applied to supply chain management.

2.1.2.6. General Supply Chain Model

The General Supply Chain Model aims to provide a comprehensive understanding of supply chains and their management (Caddy, H.1999). Existing models lack a holistic view and focus on specific elements. By combining these elements, a general model can be created, where each aspect contributes individually and collectively. The interactions among these elements within the model generate diverse effects influenced by organizational culture, operating conditions, and supply chain characteristics.

2.1.2.7. The impact of the COVID-19 Pandemic on global supply chains

The COVID-19 pandemic has had a significant impact on companies and global supply chains. It has exposed the risks of relying too heavily on a single manufacturing center, such as China, for cost advantages (Wetsman, 2020). The pandemic has disrupted transportation and highlighted the importance of diversifying sources. The global supply chain has suffered, resulting in job losses, economic decline, and reduced retail sales. The future implications are uncertain due to the unprecedented nature of the crisis. The pandemic has emphasized the value of local production as a substitute for imports, but if local producers cannot meet the demand, countries may face a crisis. The complexity of international supply chains has increased, leaving countries exposed to disruptions in different regions. China's role as a global manufacturing hub has made it a vital point in the global industrialization process.

2.1.2.8. The impact of the coronavirus on the world's supply chain

The COVID-19 pandemic has raised concerns about the future of globalization and supply chains. While reforms in the global trading system can be challenging, some changes are expected post-pandemic. The complexity of supply chains resembles biological systems, and vulnerabilities have been exposed in sectors like medical supplies and food trade.

Supply chain management involves managing the flow of goods, data, and funds throughout various activities. It has evolved with technology and changing customer expectations, and modern supply chains are complex networks operating continuously. Business success relies on effectively managing supply chains in a volatile and technology-driven environment. The pandemic has disrupted global supply chains, causing delays, shipping issues, labor shortages, and fluctuating demand. Measures have been taken to mitigate the impact, such as implementing safety protocols, adjusting the workforce, and increasing regulations.

Unwanted Effects of the COVID-19 Pandemic on Supply Chains: The COVID-19 pandemic has caused major disruptions in global supply chains, especially in China. Restrictions on transportation and trade have led to a decline in international trade volume, with ports, borders, and air freight being affected. This crisis has highlighted the vulnerability and fragility of supply chains, causing challenges in product distribution, reduced demand, and increased storage costs.

2.1.3. Packaging Industry

2.1.3.1. Definition of Packaging Industry

Packaging is essential in modern consumption as it performs several key functions such as preserving and protecting products, conveying brand image, providing information, and offering convenience. It is made from diverse materials like paper, plastic, metal, glass, and wood (PricewaterhouseCoopers, 2010). Packaging ensures the safety and hygiene of products, particularly in the food industry, where it safeguards against damage and contamination. Over time, packaging has evolved from natural materials to various forms such as wood, glass, metal, paper, cardboard, and plastic. Currently, paper and board dominate the packaging market, followed by plastics. It's important to consider the use of natural resources and proper disposal methods when using packaging materials. Industrial packaging specifically facilitates the transfer of goods from producers to consumers or to the next stage of production.

2.1.3.2. Packaging Materials

The global packaging market is categorized into five main material groups: plastics, paper and board, glass, metal, and wood (with textiles being a smaller category). The market has witnessed growth in the use of both rigid plastic materials and flexible materials over the years. These two categories are the most widely used packaging materials globally in terms of packaging units,

with flexible materials accounting for 36% of the market, followed by paper and board at 24%, and rigid plastic materials at 20%.

2.1.3.3. Packaging Industry Value Chain

The packaging industry is significantly impacted by various factors, and it is considered one of the most affected industries. It heavily relies on the import of raw materials and plays a crucial role due to its interconnectedness with numerous sectors, including FMCG/FMCD, healthcare/pharma, personal care, e-commerce/retail, and industrial packaging. The industry's influence extends to different industries, particularly the food industry.

2.2. Previous Studies

2.2.1. Arabic Studies

2.2.1.1. Study (Maha Mohamed Moustafa,2023)

The COVID-19 pandemic has had a detrimental impact on global manufacturing, including the spinning and weaving industry in Egypt. This study examines the effects of the pandemic on industry using deductive and inductive approaches. The findings indicate a decline in demand, changes in manufacturing structures, and disruptions in global supply chains. In Egypt, the spinning and weaving industry has experienced reduced local sales, increased production input costs, decreased exports, and shortages of materials. To mitigate these effects, Egypt has implemented measures to support the industry in the short term. The study suggests various long-term strategies such as reevaluating integration in global supply chains, diversifying production sources, adopting modern technologies, supporting the industry, establishing textile cities, and enhancing workers' skills to adapt to technological advancements.

2.2.1.2. Study (Eman Hamdy Abd EL-Kader& Khaled EL-Sakty,2022)

This study investigates the impact of the COVID-19 pandemic on the food industry in developed countries. It aims to uncover the consequences and effects of the pandemic on the food supply chain. The study analyzes 15 industry articles and categorizes them into two main themes: the effects at each stage of the supply chain and the overall effects on all stages. The analysis is supported by international case studies. The results reveal that firms in the food industry are adopting strategies such as localization, focusing on tier-1 supplier risk, utilizing e-commerce, adjusting inventory policies,

and exploring alternative sources of supply to manage disruptions caused by the pandemic. The study emphasizes the need to protect the food supply chain from disruptions and suggests enhancing the design and resilience of the food supply chain in the future. The findings provide recommendations and countermeasures that supply chain firms can employ to mitigate the impact of COVID-19 and maximize their response to the pandemic.

2.2.1.3. Study (Kamar Abou Sayed Mahmoud,2022)

This study focuses on the impact of the COVID-19 pandemic on hotel supply chains in Egypt and the strategies employed to mitigate disruptions. The research conducted a web-based survey among 112 five- and four-star hotels in Egypt, examining variables such as COVID-19 disruption impacts, risk alleviation practices, resilience, and robustness. The results reveal that the pandemic had a severe impact on hotel supply chains in Egypt, leading to the implementation of risk alleviation practices. However, the disruptions did not directly affect the resilience of the supply chains. The study suggests that proactive and recovery practices positively influence both supply chain resilience and robustness. These findings provide valuable insights for hotels to enhance their preparedness for future disruptions.

2.2.1.4. Study (zaradinat muhamad, qazi 'awal muhamad shukri& sahnun samir, 2022)

This analytical study investigates the impact of the COVID-19 pandemic on global supply chains. It highlights the disruption caused by the pandemic, leading to the emergence of industrial desertification centers and a global economic recession in 2020. The study identifies weaknesses in supply chains, particularly in international shipping, and emphasizes the need to enhance resilience to minimize shocks and future risks. It underscores the importance of creating smart and resilient supply chains to build a stronger global trade network. The study also reveals that inefficient planning and lack of flexibility have contributed to the weaknesses exposed by the pandemic. The disruption of international transport and the closure of production centers have further exacerbated the supply chain crisis. The study concludes by emphasizing the importance of addressing these issues and enhancing supply chain resilience to effectively navigate future challenges.

2.2.1.5. Study (Moumeni Abdelkader, Terbeche Mohammed, Benchouat soumia& Boris Ahmed, 2021)

This study examines the impact of the COVID-19 pandemic on global supply chains and provides recommendations for companies to enhance resilience and address future challenges. The pandemic has exposed vulnerabilities in global supply chains, particularly longer chains, and highlighted the dependence on China as a major supplier. The study suggests that companies should invest in mapping their supply networks to better prepare for future crises. The closure of Chinese industries due to the virus significantly affected global manufacturing sectors. Companies have two options in response to the crisis: either take no action and hope for the best or learn from the crisis and invest in mapping their supply networks to quickly identify solutions and mitigate disruptions. The study advises reassessing the length of supply chains, diversifying sourcing beyond China, and seeking local alternatives. It also highlights the importance of adopting green supply chain practices for sustainable development. Overall, the study emphasizes the need for companies to adapt, enhance resilience, and proactively address supply chain challenges for future success.

2.2.1.6. Study (Moustafa Sobhy Mahmoud Abu El Nile,2021)

This study examines the impact of the COVID-19 pandemic on air transport, with a focus on Egypt Air as a case study. The International Air Transport Association (IATA) estimated significant revenue losses of $63 billion to $113 billion in the aviation sector due to reduced passenger numbers. The collapse of the aviation industry following the pandemic has the potential to eliminate 46 million jobs globally. In Egypt, air traffic came to a halt after the spread of the virus, and Egypt Air experienced monthly losses of 1.2 billion Egyptian pounds starting from April 2020 when foreign air traffic was suspended as a precautionary measure. The study conducted interviews with directors or representatives of Egypt Air to understand the impact of the pandemic on various aspects of the airline's management, operations, and economics.

2.2.1.7. Study (Zina Hamza Gali, Ali Khalaf Gatea &Mohammed Salman Dawood 2021)

This research examines the impact of the COVID-19 pandemic on global supply chains and its effect on GDP. The study highlights the closure and suspension of economic activities due to preventive measures, resulting in economic stagnation.

Supply chains experienced significant disruptions in the first and second quarters of 2020, leading to a decline in GDP and demand. The research emphasizes the importance of agile supply chains in recovering from unexpected setbacks. Recommendations include modifying supply chains to enhance flexibility, implementing strategic risk management, reconsidering emergency stock systems, diversifying supply chains, and adopting robust storage systems to address economic challenges caused by abnormal conditions such as epidemics or emerging infectious diseases like COVID-19.

2.2.1.8. Study (Ahmad Samir, 2020)

The study examines the impact of COVID-19 on the supply chain in Egypt through a questionnaire model. Four out of five hypotheses were supported by the data. Key findings include increased sales in supermarkets for hygiene products, a rise in non-cash payments, price exploitation in the sterilization tools market, higher demand for home delivery services, the need for government support in the health sector, negative effects on airlines and tourism, and the implementation of distance education. The research suggests economic solutions and emphasizes the importance of adapting supply chains and government support in addressing the challenges posed by the pandemic.

2.2.2. Foreign studies

2.2.2.1. Study (Alok Raj,a, Abheek Anjan Mukherjee,a Ana Beatriz Lopes de Sousa Jabbour,b and Samir K. Srivastavac,2022)

The research paper focuses on the supply chain management challenges faced by manufacturing organizations during the COVID-19 pandemic, with a specific emphasis on emerging economies like India. A conceptual framework based on dynamic capability theory is presented to analyze these challenges and propose mitigation strategies. Through a literature review, analysis of news articles, and expert discussions, ten major challenges are identified, and the Grey-Decision-making Trial and Evaluation Laboratory (Grey-DEMATEL) method is used to examine the relationships between these challenges. Scarcity of Labor and Scarcity of Material are identified as the most significant challenges, while Inconsistency of Supply is found to correlate strongly with other factors. The paper concludes by providing guidelines and strategies for practitioners and researchers to address post-pandemic supply chain challenges.

The study is unique as it focuses on an emerging economy and explores supply chain challenges specific to the manufacturing sector during the COVID-19 pandemic.

2.2.2.2. Study (Amelie Meyer, Wiebke Walter & Stefan Seuring 2021)

This research paper uses text mining techniques to analyze the impact of the COVID-19 pandemic on supply chains and their sustainability. The study examines news articles from general newspapers and supply chain/logistics newspapers. The analysis reveals that the coverage of supply chain topics varies based on the type of newspaper and the number of COVID-19 infections. The study is conducted in three phases, showing a shift in focus from problems to solutions, with technology, commerce, and sustainability gaining importance in the supply chain and logistic newspapers. Sustainable supply chains initially received less attention but gained prominence after the recovery phase. However, further manual analysis is needed to provide a detailed understanding of the resilience and risk management capabilities of sustainable supply chains. The research highlights the need for unbiased and comprehensive datasets for manual literature analysis in the field of sustainable supply chains during the COVID-19 pandemic.

2.2.2.3. Study (Amine Belhadi a, Sachin Kamble b, Charbel Jose Chiappetta Jabbour c, Angappa Gunasekaran d, Nelson Oly Ndubisi e &Mani Venkatesh f 2021)

This study explores the resilience of supply chains in the automobile and airline industries during the COVID-19 outbreak. It uses a combination of qualitative and quantitative methods to assess the short and long-term response strategies adopted by these supply chains. The findings suggest that the automobile industry focused on developing localized supply sources and utilizing advanced industry 4.0 technologies to mitigate risks. In contrast, the airline industry prioritized business continuity challenges by defining operations at airports and within flights. Both sectors recognized the importance of big data analytics in providing real-time information for overcoming COVID-19 challenges. Additionally, cooperation among supply chain stakeholders and the acceleration of digital technologies were seen as crucial for resilience. The study concludes that the pandemic has disrupted global supply chains, and there is an opportunity for governments and industries to redefine business practices and build sustainable and resilient manufacturing operations through coordination and collaboration.

Further research is needed to explore the effects of the pandemic on different sectors and to promote global cooperation in adopting digital technologies.

2.2.2.4. Study (Chandler Ford 2021)

This article addresses the continuing impact of the COVID-19 pandemic on global supply chains and offers suggestions for companies to navigate the challenges. The pandemic has disrupted supply chains worldwide, resulting in operational slowdowns, shipping issues, material and labor shortages, and fluctuating demand. Multiple sectors, including automotive, tech, and medical supplies, have been heavily impacted. The duration and scope of these disruptions remain uncertain, which has legal implications for companies experiencing delays or supply shortages. However, efforts are being made to address these challenges, such as commitments from ports and retailers to increase operations. Regulatory actions are also expected from various agencies to mitigate supply chain issues. Federal agencies are actively responding to executive orders and presidential directives concerning supply chains. The release of the Fall 2021 Unified Agenda of Federal Regulatory and Deregulatory Actions by the Office of Information and Regulatory Affairs (OIRA) will provide more information on planned regulatory responses. In summary, companies need to navigate ongoing supply chain disruptions caused by the pandemic and stay informed about regulatory developments to effectively manage the impact on their operations.

2.2.2.5. Study (Ghazi M. Magableh,2021)

This study examines the impact of the COVID-19 pandemic on supply chains and presents a comprehensive framework to understand the disruptions, challenges, and trends associated with it. The framework highlights the need for continuous improvements and resilience in supply chains, considering the evolving business environment. The study emphasizes the importance of local and regional supply chains while recognizing the necessity of global value chains. It calls for increased information sharing, communication, and technological advancements to rebuild and enhance supply chain systems. The study acknowledges the need for empirical studies and real-world applications to refine the framework further. Overall, the research suggests that the pandemic has the potential to drive changes in supply chains and underscores the importance of adaptability and collaboration in the face of future crises.

2.2.2.6. Study (Jill E. Hobbs 2021)

This note assesses the implications of the COVID-19 pandemic for food supply chains, focusing on both demand-side shocks and supply-side disruptions. It discusses the impact of consumer panic buying and changes in consumption patterns, as well as potential issues such as labor shortages and transportation disruptions. The note also considers the long-term effects of the pandemic on food supply chains, including the growth of online grocery delivery and the prioritization of local supply chains by consumers. The main implication highlighted is the need to enhance supply chain resilience, moving away from the just-in-time model and towards strategic inventory management and flexible procurement strategies. Building strong and collaborative relationships among supply chain partners is emphasized, along with the importance of individual enterprise-level risk management and contingency planning. The note concludes that stakeholders in Canadian food supply chains should reflect on the lessons learned during the crisis and work towards building more robust partnerships to better withstand future crises.

2.2.2.7. Study (Joseph Sarkis 2021)

This study examines the implications of the COVID-19 pandemic on supply chain sustainability. It draws insights from literature, personal research, virtual forums, and interviews with practitioners. The findings highlight the unprecedented nature of the pandemic and its impact on operations and supply chains. The study identifies short-term environmental sustainability gains but emphasizes the need for further research on long-term effects. It emphasizes the complementarity of sustainability and resilience and calls for joint investigation. The study suggests that environmental sustainability practices can help organizations navigate crises and future competitive contexts. It identifies economic, operational, social, and ecological-environmental sustainability implications, with a focus on environmental sustainability. The authors stress the need for further research to address sustainability issues arising from the pandemic. Overall, the study highlights the need to rethink previous notions and develop new theories in the context of supply chain sustainability during and after the COVID-19 pandemic.

2.2.2.8. Study (Sanjoy Kumar Paul a, Priyabrata Chowdhury b, Md. Abdul Moktadir c & Kwok Hung Lau 2021)

This study examines the recovery challenges faced by the ready-made garment industry in Bangladesh following the COVID-19 pandemic. Using the Delphi method and the grey DEMATEL methodology, the research identifies and analyzes 23 challenges related to the pandemic, with 12 identified as causal challenges. The findings emphasize resource shortages, global economic recession, declining demand, reduced sourcing options, and increased raw material prices as key challenges. The study provides insights for decision-makers to develop strategies and reshape supply chains in the post-pandemic period. The research acknowledges its exploratory nature and suggests further longitudinal studies, investigations in other industries and regions, and empirical research to evaluate the impacts of recovery strategies on these challenges. Overall, the study contributes to the literature by addressing a timely topic and offering practical implications for supply chain recovery in the post-pandemic era.

2.2.2.9. Study (Alhanouf Abdulrahman Alsuwailem, Emad Salem, Abdul Khader Jilani Saudagar, Abdullah AlTameem, Mohammed AlKhathami 1, Muhammad Badruddin Khan 1 and Mozaherul Hoque Abul Hasanat,2020)

This study focuses on the impacts of the COVID-19 pandemic on the food supply chain in Saudi Arabia. It acknowledges the challenges faced by governments worldwide in meeting the food demands of their citizens during such crises. The study aims to analyze the behavior of food imports in Saudi Arabia and how the pandemic and precautionary measures have affected the supply chain. Statistical analysis, including descriptive measures and hypothesis tests, was conducted to examine changes in the food chain. The results indicate significant effects on the number of imported items and the countries supplying them. Importing activities showed a significant change of -47% in both items and countries. Differences in means were observed for 24 item groups and 86 countries, while the impact on 41 other countries was minimal. The comparison of means test revealed a significant decrease in 68% of item groups and an increase in 24%, with only 4% remaining unchanged. From a country perspective, 65% experienced a noticeable decrease, 16% showed a significant increase, and 19% remained the same. Overall, the study highlights the considerable impact of the pandemic on the food supply chain in Saudi Arabia, with changes in import patterns and fluctuations in item availability and country sources.

2.2.2.10. Study (CAI Min& LUO Jianwen 2020)

This paper focuses on the influence of COVID-19 on the manufacturing industry and proposes supply chain-based countermeasures. It discusses the initial impact of the pandemic, including disruptions in raw materials, logistics setbacks, and increased bankruptcy risk for SMEs. The paper also considers the aftershock of COVID-19, emphasizing regionalization and digitalization trends. Two-step countermeasures are proposed to support industry recovery during the pandemic and prepare for the post-COVID-19 era. The study emphasizes the importance of assessing impacts, addressing challenges such as supply chain interruptions, and anticipating a more regionalized and digitalized manufacturing supply chain. The proposed countermeasures involve ensuring continuous supply chain operations and enhancing resilience for future recovery and growth.

2.2.2.11. Study (Dabo Guan, etal,2020)

This study examines the global supply-chain effects of COVID-19 control measures implemented by countries to curb the spread of the virus. Using a global trade modeling framework, the researchers analyze the impact of different lockdown scenarios on supply chains. The findings suggest that the extent of supply-chain losses during the initial lockdowns is primarily determined by the number of countries imposing restrictions. Additionally, the duration of the lockdown has a greater influence on losses than the strictness of the measures. However, longer containment periods aimed at eradicating the disease result in smaller losses compared to shorter lockdowns. Implementing stricter and shorter lockdowns earlier can help minimize overall losses. Adopting a gradual approach to lifting restrictions, known as a 'go-slow' strategy, may reduce damages if it avoids the need for subsequent lockdowns. It is important to note that the complexity of global supply chains amplifies losses beyond the direct impact of COVID-19. Therefore, controlling the pandemic is a collective responsibility that requires collaborative efforts and support for countries with limited capacity.

2.2.2.12. Study (Dmitry Ivanov, 2020)

This study focuses on predicting the impacts of epidemic outbreaks on global supply chains, with a specific analysis on the COVID-19 (SARS-CoV-2) outbreak. Epidemic outbreaks present unique challenges to supply chains due to their long-term disruption, ripple effects, and high uncertainty.

The researchers utilize simulation-based methodology to examine and forecast the effects of epidemic outbreaks on supply chain performance, using COVID-19 as an example. The study highlights the importance of considering both short-term and long-term impacts, and identifies factors such as facility closure and reopening timing, lead time, speed of epidemic propagation, and upstream and downstream disruption durations as critical in determining the outbreak's impact on supply chain performance. The findings provide valuable insights for decision-makers in predicting the operational and long-term effects of epidemic outbreaks on supply chains, informing pandemic supply chain plans, and assessing risk mitigation and recovery policies. The study concludes by summarizing key insights and outlining areas for future research. Overall, the research emphasizes the need for a structured framework to guide companies in developing effective pandemic plans for their supply chains in the face of epidemic outbreaks.

2.2.2.13. Study (Marko Hakovirta and Janetta Hakovirta, 2020)

This review article discusses the need for greater research and understanding regarding the role of global trade and packaging in the transmission and survival of the SARS-CoV-2 virus. The COVID-19 pandemic has highlighted the importance of supply chains, yet there is a significant lack of knowledge in this area. The review emphasizes the urgency of conceptual advancements and research to address the risks associated with viral surface transmission in the supply chain. It suggests that coronaviruses can survive on packaging materials, and further investigation is needed to understand their stability and transmission. Different packaging materials may have varying effects on viral stability, and environmental factors in e-commerce supply chains can contribute to the survivability of the virus. The review calls for increased funding and scientific knowledge to advance understanding and mitigate health risks associated with COVID-19 and future viral threats in the supply chain and packaging.

2.2.2.14. Study (Serpil Aday & Mehmet Seckin Aday 2020)

The impact of COVID-19 on the food supply chain has been significant, affecting the entire process from production to consumption. The pandemic has resulted in movement restrictions for workers, changes in consumer demand, closure of food production facilities, restricted trade policies, and financial pressures. To address these challenges, governments should facilitate the movement of workers and agri-food products and provide financial support to small farmers and vulnerable populations.

Safety measures in food facilities should be altered to ensure the health and safety of employees. It is important to avoid food protectionist policies to prevent an increase in food prices. Flexibility in the supply chain is crucial to respond to the challenges faced in the food supply chain. Overall, each country must understand the severity of the situation and adjust measures accordingly, while ensuring the continuous flow of the food supply to prevent a food crisis and mitigate the negative impact on the global economy.

3. Research Methodology

3.1. Study Approach

This study utilizes a descriptive analytical research approach, which is useful for gaining a comprehensive understanding of phenomena through observation and analysis. The approach allows for in-depth description and exploration of solutions to problems. It helps interpret data, forecast variables, collect accurate information, and study diverse subjects. The advantages include presenting all relevant information, describing the methodology, forecasting causality, and analyzing relationships. In this study, the approach is applied to examine the relationship between COVID-19 and supply chains in the packaging sector, providing insights for future research and practical applications.

3.2. Sources of Data

This research will utilize both primary and secondary data sources. Primary data will be collected through questionnaires, interviews, and observations, capturing various aspects of key decision-makers' experiences, attitudes, and practices related to supply chains and the impact of COVID-19. Secondary data will be gathered from academic publications, business reports, governmental agencies, and other sources, providing background information and establishing the theoretical framework of the study. Annual reports, published materials, and academic research papers will also contribute to the secondary data analysis.

3.3. Population

The population of the study refers to the groups or members who possess common features or attributes. In the context of this research, the population consists of businesses or firms operating in a specific industry or sharing similarities in size, target consumers, or other relevant aspects.

The study conducted a statistical survey involving a sample of 20 businesses, which served as the foundation for the research. Several factors were considered in selecting the sample, including the geographical distribution of businesses, variations in size, operational activities, and other significant attributes.

3.4. The Study Sample

The researcher employed a random survey technique to gather data from workers and managers in the packaging businesses. Initially, an exploratory sample of 130 questionnaires was distributed to assess the reliability and validity of the questionnaire, which was essential for conducting internal structural and consistency validity tests. After ensuring the questionnaire's reliability and validity, 150 questionnaires were distributed to analyze and study the population of managers and workers in the selected packaging businesses. Out of the distributed questionnaires, 130 valid questionnaires were collected, representing the acceptable and valid responses.

3.4.1. Demographic variables

3.4.1.1. Gender variables

	Gender frequency	%	Valid %	Cumulative %
Valid male	106	81.5%	81.5	81.5
Valid female	24	18.5%	18.5	100
TOTAL	130	100%	100	

Table 1 - Distribution of study sample members according to gender variable

As shown in the previous table and the valid male respondents represents 81.5 % whereas the female respondents represent 18.5% which means that, in the selected sample, men acquire more jobs compared with women in the kingdom.

3.4.1.2. Age variable

	Frequency	%	Valid %	Cumulative %
Valid less than 30	16	12.31	12.31	12.31
Valid from 30 to 40	24	18.5	18.5	30.8
Valid from 40 to50	50	38.5	38.5	69.3

More than 50	40	30.8	30.8	100
Total	130	100	100	

Table 2 - Distribution of study sample members according to age variable

Based on the previous table and, it can be concluded that the sample consisted of 16 individuals (12.31% of the total sample) who were below the age of 30. There were 24 members (18.5%) between the ages of 30 and 40, 50 respondents (38.5%) between the ages of 40 and 50, and 40 respondents (30.8%) who were over the age of 50. Therefore, it is evident that the majority of workers in the packaging businesses in the kingdom are aged 40 years and above, indicating that they play a significant role in these businesses.

3.4.1.3. Scientific major

	frequency	%	Valid %	Cumulative %
Employee	40	30.8	30.8	30.8
Head of Department	21	16.2	16.2	47
Deputy director	5	3.9	3.9	50.9
director	64	49.1	49.1	100
Total	130	100	100	

Table 3 - Distribution of study sample members according to Scientific major variable

The table shows the distribution of roles among the sample members, revealing that 30.8% are employees, 49% are directors, 16.2% are heads of departments, and 3.9% are deputy directors. The analysis indicates a significant presence of active workers and directors, emphasizing the importance placed on supply chains within the businesses. The distribution of roles reflects the impact supply chains can have on overall business performance.

3.4.1.4. Years of experience variable

	frequency	%	Valid %	Cumulative %
Valid less than 5 years	11	8.5	8.5	8.5
Valid from 5 – 10 years	19	14.6	14.6	23.1
Valid from 10 –15years	11	8.5	8.5	31.6
Valid more than 15 years	81	62.3	62.3	100

Total	130	100	100	

Table 4 - Distribution of study sample members according to Years of experience variable

The table displays the distribution of years of experience among the selected sample, with 14.6% having 10-15 years of experience, 62.3% having more than 15 years of experience, 14.6% having 5-10 years of experience, and 8.5% having less than 5 years of experience. The analysis indicates that a significant majority of the sample possesses extensive experience, particularly exceeding 15 years. This suggests a deliberate emphasis on allocating experienced personnel to supply chain roles, indicating the importance of effective management of supply chain operations.

3.5. Study Tool

3.5.1. Questionnaires

A questionnaire is a primary data collection technique used to gather targeted information from respondents about a specific problem or phenomenon. In this study, a questionnaire is used to assess the response and interaction of supply chain management (SCM) workers in packaging businesses to the COVID-19 pandemic. The questionnaire utilizes a Likert scale with five levels to analyze the impact of the pandemic on SCM. The questionnaire is structured into dimensions that cover personal data, COVID-19 experiences, and SCM aspects such as spare parts availability and raw material costs.

3.5.2. Interview

Interviews are a primary data collection method used to gather specific information about attitudes, perceptions, opinions, and similar subjects. They provide a closer connection with respondents and allow flexibility in adapting or modifying questions. In this study, interviews will be conducted to collect specialized primary data from managers and key decision-makers in supply chain departments of packaging businesses. The purpose is to investigate the direct and indirect impacts of the COVID-19 pandemic on the supply chain. Interviews will provide deeper insights and explore the nuanced effects of the pandemic on supply chain operations.

3.5.3. Observation

Observation is a primary data collection technique that complements questionnaires and interviews in this study. The researcher will engage in observational activities to gain insights into different aspects of the supply chain (SC) in packaging firms.

This includes observing documentation processes, tools used, and other observable factors related to SC operations. Additionally, observations will focus on interactions and collaborations among SC department workers and other members of the packaging firms. The observation process will also assess the internal business environment, supportive procedures, and internal control systems that empower and assist SC workers in fulfilling their tasks and responsibilities.

3.6. Reliability and Validity

3.6.1. Reliability

The reliability of a test is important to ensure consistent and accurate measurements. In this study, two methods are used to assess reliability. Cronbach's alpha coefficient measures the internal consistency of the scale and all coefficients in this research exceed the acceptable threshold of 0.70, indicating good reliability. The Honesty scale is also mentioned as a method to assess respondent honesty by rating responses on a specific scale.

Paragraph	Stability coefficient (α)
Covid 19 pandemic	
Political and economic constraints	0.9
Social constraints	0.84
E – businesses	0.67
Demand and economic conditions	0.66
Total	0.73
Cost of raw materials	0.82
Availability of spare parts	0.93

Table 5 – Reliability Test (Cronbach's alpha coefficient)

3.6.2. Validity

Validity is essential in research to ensure that methods accurately measure what they intend to measure. In this study, steps were taken to establish the apparent validity of the questionnaire. Feedback was sought from experts in the field to ensure clarity and comprehensibility of the questions, and their suggestions were incorporated to improve the questionnaire. These measures enhance the validity of the questionnaire and increase confidence in the reliability and accuracy of the research findings.

4. Analysis of the Results

4.1. Descriptive Statistics of the Three Variables

Variable	Items	Mean	SD	General Trend	Relative Index	Order
COVID-19 Pandemic	8	4.31	0.78	Strongly Agree	86%	1
Supply Chains	15	4.14	0.71	Agree	83%	2
Raw Material & Spare Part	6	4.05	0.75	Agree	81%	3
Total	29	4.17	0.75	Agree	83%	------

Table 6 – Descriptive statistics of the three variables (Mean, standard deviation, relative importance)

For all survey (29 questions); the mean reached 4.1, this reflects that the general trend for the respondents tend to the scale of agree, and the value of the relative index for the three variables is between 81% to 86% with average 83%, since the "COVID-19 Pandemic" variable has the highest relative important index, while the "Raw Material & Spare Part" variable has the lowest relative important index as shown in table.

4.2. F-Test (Anova) Result of Test the Difference between the Responses Study Based on Gender

Hypothesis	Variable	Gender	N	Mean	SD	t-test	p-value	Result
H1.a	COVID-19 Pandemic	Male	106	4.5165	.47216	0.512	0.61	Reject *H1.a*
		Female	24	4.4583	.62409			
H1.b	Supply Chains	Male	106	4.1981	.53371	1.122	0.264	Reject *H1.b*
		Female	24	4.0625	.53796			
H1.c	Raw Material & Spare Part	Male	106	4.0959	.61762	1.734	0.085	Reject *H1.c*
		Female	24	3.8542	.61250			

Table 7 – (F-TEST) (ANOVA) result of test the difference between the responses study based on gender

we note that there are no statistically significant differences in the degrees of COVID-19 Pandemic, Supply Chains, and Material & Spare Part in the packaging sector in the Kingdom of Saudi due to the gender variable. This indicates that the gender variable is not an influencing variable on the responses of the study sample for the three variables (COVID-19 Pandemic, Supply Chain, Materials and Spare Parts) because the p-values of three t-tests (0.61, 0.264, 0.085) are greater than 0.05. Then we can reject H1.a, H1.b, and H1.c as shown in table.

4.3. F-Test (Anova) Result of Test the Difference between the Responses Study Based on Age

Hypothesis	Variable	Age	N	Mean	SD	F-test	p-value	Result
H2.a	COVID-19 Pandemic	Less than 30 years	16	4.406	.5468	.692	.559	Reject *H2.a*
		From 30 to less than 40	24	4.625	.4834			
		From 40 to less than 50	50	4.500	.5176			
		From 50 or more	40	4.481	.4783			
		Total	130	4.506	.5014			
H2.b	Supply Chains	Less than 30 years	16	4.031	.4323	1.065	.366	Reject *H2.b*
		From 30 to less than 40	24	4.167	.5647			
		From 40 to less than 50	50	4.132	.5482			
		From 50 or more	40	4.285	.5347			
		Total	130	4.173	.5350			
H2.c	Raw Material & Spare Part	Less than 30 years	16	3.708	.5358	3.323	.022	Accept *H2.c*
		From 30 to less than 40	24	3.986	.5916			

		From 40 to less than 50	50	4.030	.5751			
		From 50 or more	40	4.254	.6720			
		Total	130	4.051	.6215			

Table 8 – (F-TEST) (ANOVA) result of test the difference between the responses study based on age

we note that there are no statistically significant differences in the degrees of COVID-19 Pandemic and Supply Chains in the packaging sector in the Kingdom of Saudi due to the age variable. This indicates that the age variable is not an influencing variable on the responses of the study sample for the variables (COVID-19 Pandemic, Supply Chain) because the p-values of F-tests (0.559, 0.366) are greater than 0.05. Then we can reject H2.a and H2.b. But for the Raw Material & Spare Part, we note that there is a statistically significant difference bettwen the levels of the age, because the p-value of F-test (0.022) is less than 0.05. Then we accpted H2.c shown in table.

F-Test (Anova) Result of Test the Difference between the Responses Study Based on Job Title

Hypothesis	Variable	Job title	N	Mean	SD	F-test	p-value	Result
H3.a	COVID-19 Pandemic	Employee	40	4.513	.5458	.272	.845	Reject *H3.a*
		Head of Department	21	4.488	.3831			
		Deputy director	5	4.700	.6708			
		Director	64	4.492	.5019			
		Total	130	4.506	.5014			
H3.b	Supply Chains	Employee	40	4.054	.5682	1.518	.213	Reject *H3.b*
		Head of Department	21	4.127	.5107			
		Deputy director	5	4.450	.4150			
		Director	64	4.241	.5216			

		Total	130	4.173	.5350			
H3.c	Raw Material & Spare Part	Employee	40	3.858	.6344	1.940	.126	Reject *H3.c*
		Head of Department	21	4.095	.6424			
		Deputy director	5	4.133	.6912			
		Director	64	4.151	.5877			
		Total	130	4.051	.6215			

Table 9 – (F-TEST) (ANOVA) result of test the difference between the responses study based on job title

we note that there are no statistically significant differences in the degrees of COVID-19 Pandemic, Supply Chains, and Material & Spare Part in the packaging sector in the Kingdom of Saudi due to the job title variable. This indicates that the job title variable is not an influencing variable on the responses of the study sample for the three variables (COVID-19 Pandemic, Supply Chain, Materials and Spare Parts) because the p-values of three F-tests (0.845, 0.213, 0.126) are greater than 0.05. Then we can reject H3.a, H3.b, and H3.c as shown in table.

4.4. F-Test (Anova) Result of Test the Difference between the Responses Study Based on Experience Years

Hypothesis	Variable	Experience	N	Mean	SD	F-test	p-value	Result
H4.a	COVID-19 Pandemic	Less than 5 years	11	4.364	.6742	.437	.727	Reject *H4.a*
		From 5 to 10 years	19	4.487	.5681			
		From 10 to 15 years	19	4.579	.3233			
		More than 15 years	81	4.512	.4983			
		Total	130	4.506	.5014			

H4.b	Supply Chains	Less than 5 years	11	3.924	.4207	1.745	.161	Reject *H4.b*
		From 5 to 10 years	19	4.114	.4056			
		From 10 to 15 years	19	4.368	.3314			
		More than 15 years	81	4.175	.5994			
		Total	130	4.173	.5350			
H4.c	Raw Material & Spare Part	Less than 5 years	11	3.546	.51690	3.333	.022	Accept *H4.c*
		From 5 to 10 years	19	3.947	.5529			
		From 10 to 15 years	19	4.070	.4979			
		More than 15 years	81	4.140	.6474			
		Total	130	4.051	.6215			

Table 10 – (F-TEST) (ANOVA) result of test the difference between the responses study based on experience years

we note that there are no statistically significant differences in the degrees of COVID-19 Pandemic and Supply Chains in the packaging sector in the Kingdom of Saudi due to the experience variable. This indicates that the experience variable is not an influencing variable on the responses of the study sample for the variables (COVID-19 Pandemic, Supply Chain) because the p-values of F-tests (0.727, 0.161) are greater than 0.05. Then we can reject H4.a and H4.b. But for the Raw Material & Spare Part, we note that there is a statistically significant difference bettwen the levels of the experience, because the p-value of F-test (0.022) is less than 0.05. Then we accpted H4.c

5. Results

The study found that officials and workers in the packaging sector in Saudi Arabia strongly agreed with statements related to the COVID-19 pandemic. They also showed a high level of agreement with statements regarding supply chains and raw materials & spare parts. However,

there were no significant differences based on gender, age, job title, or experience years, except for raw materials & spare parts, where age and experience years showed a significant difference.

The study used a structural equations model and found that the COVID-19 pandemic had a significant impact on supply chains and raw materials & spare parts in packaging factories. The relationship between COVID-19 and supply chains was moderated by the level of raw materials & spare parts.

The study also highlighted the severe repercussions of the pandemic on industries worldwide, including disruptions in the availability and supply of materials and products. The pandemic significantly influenced the culture of remote work and technology utilization. The findings emphasize the importance of proactive crisis management plans, considering international and local specifications, customer needs, and ensuring the provision of necessary spare parts and continuous improvement in supply systems for companies.

5.1. Recommendations

The following recommendations are suggested for various stakeholders based on the study findings:

5.1.1. Researchers

This study aims to analyze the changes in work, supply chains, and spare parts domains following the COVID-19 pandemic. It investigates the pandemic's impact on various production and distribution factors. The study explores the reasons for the weakened employee orientation towards work resulting from the pandemic. Additionally, it examines the reluctance of companies to share their policies and strategies with suppliers, despite the significance of commitment and respect in supplier relationships.

5.1.2. Companies

This study emphasizes the need to embrace technological advancements and remote working to capitalize on cost-saving and time-saving opportunities. It recommends fostering stronger relationships with suppliers through active sharing of policies and strategies. Furthermore, maintaining adequate stock levels of raw materials and spare parts is highlighted as a crucial measure to enhance resilience and better cope with future pandemics or crises.

5.1.3. Individuals

Enhance remote working skills and adapt to new technologies, as it provides flexibility and the ability to work from anywhere.

5.1.4. Government

This study emphasizes the importance of capitalizing on the potential of remote services and further developing them. It suggests promoting the adoption of cost-effective high technology solutions in remote work while ensuring quality standards are upheld. Additionally, the study recommends expanding the utilization of new technologies across different sectors to enhance efficiency and productivity.

6. References

Ahani, A. and Nilashi, M. (2020). "Coronavirus Outbreak and its Impacts on Global Economy: The Role of Social Network Sites", Journal of Soft Computing and Decision Support Systems, 7 (2), pp.19-22.

Alok Raj,a, Abheek Anjan Mukherjee,a Ana Beatriz Lopes de Sousa Jabbour,b and Samir K. Srivastavac, Supply chain management during and post-COVID-19 pandemic: Mitigation strategies and practical lessons learned

Alsuwailem, A. A., Salem, E., Saudagar, A. K. J., AlTameem, A., AlKhathami, M., Khan, M. B., & Hasanat, M. H. A. (2022). Impacts of COVID-19 on the food supply chain: A case study on Saudi Arabia. Sustainability, 14(1), 254.

Amine Belhadi a, Sachin Kamble b, Charbel Jose Chiappetta Jabbour c, Angappa Gunasekaran d, Nelson Oly Ndubisi e &Mani Venkatesh f, Manufacturing and service supply chain resilience to the COVID-19 outbreak: Lessons learned from the automobile and airline industries, Technological Forecasting & Social Change 163 (2021) 120447

Beamon, B. (1998). Supply Chain design and analysis: Models and methods. [Online] Available: http://www.damas.ift.ulaval.ca/~moyaux/coupfouet/beamon98.pdf (July 21, 2011).

Caddy, I. H. (1999). Supply Chain and Supply Chain Management: Towards a Theoretical Foundation. International Conference on Managing Enterprises.

CAI Min& LUO Jianwen, J. Shanghai Jiao Tong Univ. (Sci.), 2020, 25(4): 409-416, Influence of COVID-19 on Manufacturing Industry and Corresponding Countermeasures from Supply Chain Perspective

Chandler Ford, How COVID-19 is Impacting Global Supply Chains & How Companies Can Cope, The National Law Review / The National Law Forum LLC,2021, National Law Review, Volume XI, Number 294

Chow, D., & Heaver, T. (1999). Logistics strategies for North America. (3rd ed.). Global Logistics and Distribution Planning

Christopher M, Peck H. Building the Resilient Supply Chain. The International Journal of Logistics Management. 2005; 15:1-13.

Dabo Guan, Daoping Wang, Stephane Hallegatte, Steven J. Davis, Jingwen Huo, Shuping Li, Yangchun Bai, Tianyang Lei, Qianyu Xue, D'Maris Coffman, Danyang Cheng, Peipei Chen, Xi Liang, Bing Xu, Xiaosheng Lu, Shouyang Wang, Klaus Hubacek & Peng Gong, Global supply-chain effects of COVID-19 control measures, Nature Human Behaviour volume 4, pages577–587 (2020)

ECDC. (2020). An overview of the rapid test situation for COVID-19diagnosisIn the EU/ EEA. https://www.ecdc.europa.eu/en/publications-data/overview-rapid-test

Ghazi M. Magableh 2021, European Management Review. 2021 autumn; 18(3): 363–382. Supply Chains and the COVID-19 Pandemic:AComprehensive Framework

Hakovirta, M., & Hakovirta, J. (2020). Transmittance and survival of SARS-CoV-2 in global trade: The role of supply chain and packaging. Journal of Packaging Technology and Research, 4, 261-265.

Hamdy Abd EL-Kader, E., & EL-Sakty, K. (2022). THE EFFECT OF THE COVID-19 PANDEMIC ON FOOD SUPPLY CHAIN DISRUPTION IN DEVELOPED COUNTRIES.

Hofmann, E. (2013). Supply Chain Management: Strategy, Planning and Operation, S. Chopra, P. Meindl.

Ivanov, D. (2020). Predicting the impacts of epidemic outbreaks on global supply chains: A simulation-based analysis on the coronavirus outbreak (COVID-19/SARS-CoV-2) case. Transportation Research Part E: Logistics and Transportation Review, 136, 101922.

Iyer K. Demand chain collaboration and operational performance: Role of IT analytic capability and environmental uncertainty. Journal of Business & Industrial Marketing. 2011; 26(2):81-91.

Lai, C.-C., Shih, T.-P., Ko, W.-C., Tang, H.-J., Hsueh, P.-R., 2020. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): the epidemic and the challenges. Int. J. Antimicrob. Agents 55 (3).

Mentzer, J. T., DeWitt, W., Keebler, J. S., Min, S., Nix, N. W., Smith, C. D., and

Moumeni Abdelkader, Terbeche Mohammed, Benchouat soumia& Boris Ahmed.2021 The Impact Of Corona Virus On Global Supply Chains (Crisis – Solutions – Horizons), Journal of Economic Studies,15(2), 375-387

Moustafa Sobhy Mahmoud Abu El Nile 2021, The impact of Coronavirus (COVID-19) on The Air Transport: A Case Study of Egypt air, *Journal of Association of Arab Universities for Tourism and Hospitality*, *20*(2), 287-323.

PricewaterhouseCooopers (2010) Sustainable Packaging: Threat or Opportunity. Available at: https://www.pwc.com/gx/en/forest-paper-packaging/pdf/sustainable -packaging-threat-opportunity.pdf

Sanjoy Kumar Paul a,*, Priyabrata Chowdhury b, Md. Abdul Moktadir c, Kwok Hung Lau, Supply chain recovery challenges in the wake of COVID-19 pandemic, Journal of Business Research 136 (2021) 316–329

Sarkis, J., Dewick, P., Strauss, S., Schroeder, P.M., Vazquez-Brust, D.A. and Kruger, R. (2020c), "CE forum-post-COVID summary report", doi: 10.13140/RG.2.2.25795.43047.

Serpil Aday and Mehmet Seckin Aday, Food Quality and Safety, 2020, 4, 167–180, Impact of COVID-19 on the food supply chain

Stevens GC (1989) Integrating the supply chain. Int J Phys Distrib Mater Manag 19(8):3–8

Wetsman, N. (2020, April 27). The algorithms big companies use to manage their supply chains don't work during pandemics. Consulté le 5 30, 2020, sur the verge: https://www.theverge.com/2020/4/27/21238229/algorithms-supply-chain-model-pandemic-disruption-amazon-walmart.

Wisner, J. D., Tan, K. C., & Leong, G. K. (2014). Principles of supply chain management: A balanced approach. Cengage Learning.

Doi: https://doi.org/10.52133/ijrsp.v4.46.3